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(*b*) Communicate to parties interested, also as promptly as possible, the above information.

(*c*) Indicate the wages paid for farm work.

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FIRST PART.

ORIGINAL ARTICLES

Instruction in Agricultural Housekeeping in Belgium

by

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I. — AIM OF AGRICULTURAL HOUSEKEEPING INSTRUCTION.

While the spread of agricultural instruction exercises a favourable in-
ence on the increase of agricultural production, the special instruc-
n of women engaged in rural pursuits tends not only to increase the ma-
ial resources of the farm, but also to raise the social level and improve
e general well-being of the cultivator. Is it not the duty of the farmer's
fe to look after the upbringing of the children, to provide nourishing and
petizing food for the family, to keep the house in good order from an aes-
tic and a hygienic point of view and to see to the general comfort of
family?

All these considerations have been taken into account in the organiza-
n of agricultural housekeeping schools in Belgium; they are not ordinary
ools of domestic economy for country girls, but rather technical insti-
es for the training of future farmers' wives, where they acquire a know-
ge of and devotion to their profession.

Agricultural instruction for girls, begun twenty-three years ago, has
tended rapidly and there are indeed few countries in which this organi-
ion is so well developed as in Belgium.

These schools can be classed as permanent or fixed, and temporary or
velling.

II. — PERMANENT SCHOOLS.

These consist of three types: A, Agricultural Housekeeping Schools; B, Agricultural Housekeeping Sections; C, Elementary Technical Agricultural Sections.

A. Agricultural Housekeeping Schools. — There is no agricultural instruction of a higher or university standard for girls. The permanent farm schools give instruction of a secondary standard. They aim at giving a sound technical education suitable for young women intending to take up agriculture. The instruction comprises a theoretical and practical course in the following subjects: Natural History, elements of Agriculture, Kitchen Gardening and Flower-growing, the elements of Animal Husbandry, Dairying, Domestic Economy, the elements of Pedagogy and Hygiene, the elements of Commerce and Book-keeping. There are also occasionally Courses in Common Law and Social Economics.

The courses are generally divided into two years of study.

The development of this scheme, its internal organization and the relative importance of the theoretical and practical work are not the same for all schools. The scheme and detailed time-table of instruction are submitted for the approval of the Minister of Agriculture. The following is a scheme of practical work for one of the schools:

In groups of from 4 to 6 the pupils take their turn in feeding the live stock, milking the cows, calculating the feeding value and price of the rations learning to recognise the good and bad points of live stock, making butter and cheese, and analysing the dairy products. They also take charge of the poultry-yard, superintend the hatching of chickens both artificially and naturally, and undertake the rearing of poultry, fattening of pullets and their preparation for the market. They take charge of the apiary, take the swarms gather the honey and the wax and prepare hydromel. They grow vegetables and flowers, prune fruit-tres, prepare jams and preserved fruits, make wine and various beverages from garden fruit, and keep accounts.

In Domestic Economy they make and repair clothes, wash, bleach and iron linen, prepare meals, and are responsible for the decoration of the houses and gardens.

At these schools, the instruction is entirely free, but the pupils pay for their board. They keep a strict account of the income and expenditure of the establishment; each month an account is made out for each member either mistress or pupil, who then contributes her share.

There are thirteen such schools in Belgium: Bastogne, Berlaer, Bouchout, Brugelete, Celles, Gortemarck, Cooreind, Gijseghem, Héverlé, Herve, Overijsche, 'S Gravenwezel, Virton, Wavre-N. Dame. With the exception of those at Bouchout and Virton all these schools are under one central institution of general instruction.

The Department of Agriculture contributes to the expenses according to the scheme of development, the value of its staff of instructors, and the importance of the station and its equipment, by subsidies varying from 1000 to 4000 francs (£40 to £160).

The age of admission for pupils is 14. To facilitate study and to avoid loss of time in taking notes the pupils are provided with type-written summaries or they make use of text-books. These are also useful for women who wish to study at home.

At the end of the course the pupils may be examined before a board omposed of a delegate from the Department of Agriculture, a delegate from he province (in cases where the school is subsidised by the provincial overnment), and members of the staff.

To encourage attendance, the public authorities offer scholarships to upils. The Department of Agriculture also offers scholarships to students n the application of the candidate and the recommendation of the examiing board. Certain provinces include an annual allowance in their budgets or distribution as scholarships for pupils of particular schools.

B. Agricultural Housekeeping Sections. — These aim at inculcating taste for agriculture and at the same time imparting general instruction. he course corresponds to a lower secondary standard.

The technical instruction and the practical work is more limited than the true agricultural housekeeping schools. The scheme of work comises elements of Agriculture, Dairying, Domestic Economy and Bookeeping. Four hours per week are devoted to theoretical and about the me to practical work. The government subsidies amount to 750 to 000 francs (£30 to £40) per year for each section. Sections are estaished at Champion, Jodoigne, Maulde, Tessenderloo and Waremme.

C. Elementary Agricultural Sections. — The foregoing courses are for rls who can put in at least one full year's study, whilst these elementary ctions are intended for the children of small holders, who have to assist eir parents in farm work at an early age.

In general they are in connection with public or private elementary ools and the scheme of work is capable of modification according to al conditions. Thus there are some which work only during the slack iod in the farm work, others for one afternoon per week throughout the ar, others in the evening or on Sundays.

Attendance at these courses is gratuitous. The Departments of ence and Arts and of Agriculture may collaborate in the organization these sections. The former makes grants to the adult schools, while latter gives an annual grant of 350 to 750 francs (£14 to £30) and pays f the expenditure of the necessary equipment for the course in iculture.

Elementary sections for girls, of recent creation, are as yet only 10 in mber, but it may be safely predicted that, when better known, they will idly increase, for they are destined to render valuable services to the ral population.

These courses are already in existence at Appelterre, Borsbeke, Hélé, Terbanck, Iseghem, Resseghem, Rondu, Salmchâteau, Vezon, Vorst d Zeelhem.

III. — Temporary or Travelling Schools.

The temporary agricultural housekeeping schools are moved two or ee times a year from one canton to another, and form one of the st interesting features of agricultural education in Belgium. When

they were started, in 1890, they immediately met with great success. Thes schools were originally founded for the development of the national dair industry, and their first object was a rapid dissemination in the country di tricts of the best methods of utilising milk and of making butter and chees At present the session lasts four months, and the course comprises Crop Live Stock, Dairying, Cheese-making, Domestic Economy, Poultry-keepin and Book-keeping.

These schools are provided on the request of the community, or of a agricultural organization or society, with the pecuniary assistance of th State, the province, the community or the agricultural society. The bud get of these schools reaches about 2 500 francs (£ 100) for a session of fou months.

The instruction given is theoretical and practical and the classes ar held every week-day, two hours being devoted to theory and three to prac tical work. All the pupils are external, the maximum number not exceec ing 20. Attendance at the course is entirely free.

In order to be admited to the classes, girls must comply with the fo lowing conditions: 1) age 15; 2) possess a good elementary education at tested by a certificate; 3) physical fitness for the work. The staff of instruc tors consists of 1) a director, who gives the course in Crops and Live Stoc and is responsible for the organization of the school (these positions ar filled by State agriculturists); 2) two resident mistresses, who give the cou ses in Domestic Economy, Dairying, Cheese-making and Book-keeping they also direct the practical work. The mistresses receive a fixed salar paid by the State. During the period when the schools are closed, they giv lectures and public courses for farmers' wives.

For practical work, all the schools are furnished with appropriat material (separators, churns, butter-workers, refrigerators, butyrometer cheese-making utensils, cooking utensils, lye-washers, sewing-machines, etc.

At the end of each session an examination is held in all the branche of instruction and in practical work. The examining board consists the staff and a delegate from each authority patronising the school. Since th foundation of these schools, more than 6 000 girls have received diplo mas.

At present there are thirteen such schools in the country, distributed follows:

Province	Number
Antwerp	2
W. Flanders	2
Brabant	1
E. Flanders	1
Liège	1
Limbourg	1
Luxembourg	3
Namur	2
Total	13

The success of these schools is generally much greater than that of the ermanent ones. Owing to the scarcity of labour in the country the small r average cultivator has difficulty in sending his children to school for ne or two years about the age of 15. The travelling school, lasting only months, may be said almost to carry the instruction to the pupils' homes, th the result that they are more easily got together.

It is often found that when a new session is opened in a place where e has already just been held the applications for admission are more merous, which shows that the farmers' wives appreciate the technical struction as soon as they get to know it.

IV. — Lectures and Farm Women's Circles.

The organisation of public lectures and the creation of farm womens' cles are the most successful of all methods for the rapid diffusion of tech-cal instruction of women in the country. They constitute a real extension agricultural housekeeping education.

For two years the Department of Agriculture has been organising *tures* on various subjects of interest to farm women: provisioning the usehold, management of the kitchen and fruit garden, preservation fruits and vegetables, feeding of live stock, dairying, poultry-keeping, giene, etc. These lectures are instituted on the recommendation of ate agriculturists or on request from an association of farm women. Every-ere they are accorded the warmest possible welcome, and the average tendance is as high as 70.

The *farm women's circles*, are associations of country-women, who, by eans of lectures, the institution of libraries, and competitions, attempt circulate the information necessary to the proper management of a rural usehold or farm. To organize a circle, a large number of members is t necessary to begin with. Very often it is sufficient to call together some l pupils of agricultural housekeeping schools and a few intelligent country-omen, to explain to them the aim of the periodic meetings and to sub-it to them a very simple draft of rules.

If the circles wish to become proprietors of various objects, they are anted the legal form of a professional union. The resources are made up m members' subscriptions (generally very small) and from gifts of patrons. blic authorities may assist by organizing lectures, libraries and competi-ns.

In six years 183 circles have been formed, with a membership of 21 500. 1912 the farm women's circles organised 806 meetings. The circles are ited to form federations, three of which run journals.

V. — Conclusion.

Agricultural housekeeping instruction has rendered and still continues render most valuable services to the agricultural population of Belgium, yet, however, it only reaches a select few, representing less than 1 per

cent. of the girls who might profit by it. Thus it is by increasing the numbe of easily accessible schools and popularising the methods of scientifi agriculture that improvements in the conditions of rural life and the rai sing of the dignity of the agricultural profession can be effected. When th farmer's wife has realised the fullness of her duty and learnt a better ap preciation of rural life, and her daughters no longer seek to leave the country the young men will be more ready to take up an agricultural life.

Present Organization of Agricultural Meteorology in Swede

by

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The Swedish Meteorological Service in the continental part of the cou try is chiefly centralized at the Central State Meteorological Institute whi depends, from an administrative point of view, from the Royal Acader of Sciences and has been at work since 1873. There is besides a Meteoi logical Observatory of the first class at Upsala depending from th University.

There is no special service for agricultural meteorology at the Cent Meteorological Institute. But an endeavour has been made to organi the observations in the numerous stations, as well as their publicatic and in general the whole service, in such a manner as to give satisfacti not only to the many requirements of the public in the matter of meteoi logical intelligence of all kinds, but also to the agricultural classes. Wi this object in view, the Institute has naturally tried to conform to t resolutions taken from time to time by the International Meteorologic Congresses and committees.

In the interests of agriculture the Institute's activity consists in: daily meteorological service; 2) regular observations of the temperatu and hygrometric state of the air, direction and velocity of the wind, dur tion of sunshine, degree of cloudiness, rain and snowfall; 3) observatio on storms, state of the ice, and on phenomena interesting the animal a vegetable kingdom and agriculture.

1.—For the daily meteorological service the Institute receives throug out the year telegrams giving meteorological observations taken in the eve ing and in the morning by 16 home and 68 foreign stations, in all 84. Wi the assistance of all these telegrams two synoptic charts are drawn up dail the morning one being exposed to the public in five places in the capit The most important observations contained in the morning telegrams a communicated to 9 daily papers of the capital under the form of a tab accompanied by a summary of the state of the atmosphere and by a for

st for the following 24 hours. Three of the papers with the widest circula- nt publish meteorological charts.

The summary and the forecasts are telegraphed between 11 o'clock 1 noon to those communes who pay a fixed subscription for this purpose the telegraph administration. A shorter summary, as well as the forecasts, lso sent to the managers of the State railways, who expose them to the blic in all the large stations. This arrangement has also been adopted several private railway companies. This intelligence is also communi- ed by telephone to private persons.

In July, August and September a special afternoon meteorological service ganized for the benefit of agriculture. For this purpose the Institute re- ves during the above period the morning telegrams containing the obser- ions made in the evening and in the morning of 6 other home and one ier foreign stations, as well as the afternoon telegrams from 17 home and foreign stations. The forecasts that are drawn up by means of these egrams are published between 5 and 6 p.m.; they are hung up to the blic in five places in the capital; they are communicated to the newspapers l spread like the morning intelligence by means of the telegraph and ephone.

2. — The observations on the temperature and hygrometry of the air, ection and velocity of the wind, cloudiness and amount of sunshine, are de regularly three times a day in 37 stations of the second class kept by the te, and by a small number of private stations (8 in 1912). In these sta- is readings are also taken of maximum and minimum temperatures, of snow and rainfall, as well as observations on storms, hail, fog, etc. The ervations of 18 stations are published in full in the collection called vedish Meteorological Observations", published since 1859, with a new es since 1873; those of the other stations are given under the form of ual tables. In this publication the monthly reports of about a hundred ate stations of the third class (about which more below) are inserted.

A network of stations of the third class, for the most part private, has ited since 1878, especially for rainfall reading and also for observations he temperature of the air, and if to these be added about 40 stations in thouses in which the amount of rainfall and temperature are observed, as l as the hydrographic stations which have been established during recent rs, a total of 633 raingauge stations is reached for the year 1912. The quan- of monthly rainfall, the maximum for 24 hours, as well as the number lays with rain, snow, storm and frost (minimum below freezing point) hoted in the periodical bearing the title "Swedish Monthly Meteorological letin in the Interests of Agriculture" (33rd year, 1913). Each number tains a chart showing the quantity of rainfall, and a certain number of les on the temperatures of the air and the soil, and the winds, besides mmunications from observers, etc.

3. — Besides the observations mentioned above and which are mainly le by instruments, several persons observe certain phenomena which of interest to agriculture (storms and the state of the ice), as well as phe- hena in the vegetable and animal kingdoms (phenological observa-

tions) and in agriculture. Night frosts dangerous to vegetation were equall noted by these observers; at present they are set forth (since 1881) in t monthly bulletins of a certain number of rainfall stations. This syste of stations, called fourth class stations, was organized in 1871 by Profes H. H. Hildebrandsson at Upsala, and was adopted in 1881 by the Cent Meteorological Institute. Nevertheless, owing to want of funds wherewi to pay them, the observers of phenomena in the vegetable and animal kin doms are now not numerous.

Besides the periodicals mentioned above as works that may be imp tant to agriculture from the meteorological point of view, the followi may be noticed.

H. E. HAMBERG. La température et l'humidité de l'air à différentes hauteurs obser à Upsal pendant l'été de 1875. — *Nova Acta Reg. Soc. Sc. Ups.*, Series III, 1 37 pages, 1 pl. Upsala, 1876.

H. H. HILDEBRANDSSON. The storms in Sweden 1871 - 1875 (in Swedish). Supplemen the *Mémoires de l'Académie Royale des Sciences de Suède*, VI, No. 13, 22 pages, 1 Stockholm, 1877.

H. H. HILDEBRANDSSON and C. A. RUNDLUND. Prise et débâcle des lacs en Su automne 1871-printemps 1877. — *Nova Acta Reg. Soc. Sc. Ups.*, Series III, 1878, 8 pa 3 pl. Upsala, 1879.

H. W. ARNELL. The Development of Vegetation in Sweden from 1873 to 1875 (in Swedish) *Annales de l'Université d'Upsal*, 1878, pages 84, 3 pl. Upsala, 1878.

H. H. HILDEBRANDSSON. Marche des isothermes au printemps dans le nord de l'Europe *Nova Acta Reg. Soc. Sc. Ups.*, Series III, 1880, 10 pages, 3 pl. Upsala, 1880.

A. C. HÖGBOM. Marche des isothermes en automne dans le nord de l'Europe. — *Nova A Reg. Soc. Sc. Ups.*, Series III, 1883, 8 pages, 4 pl. Upsala, 1883.

H. E. HAMBERG. De l'influence des forêts sur le climat de la Suède I-V. Supplément du port de l'Administration des Domaines sur les forêts, Années 1884, 1887, 189 Swedish and in French). I et II: Organisation et température, 76 pages, 1 pl.; III: nidité de l'air, 58 pages, 1 pl.; IV et V: Eaux tombées, et couche de neige, 128 pages, 18 + 12 pl. Stockholm, 1885, 1889, 1896.

H. MOHN and H. H. HILDEBRANDSSON. Les orages dans le peninsule scandinave. — *Acta Reg. Soc. Sc. Ups.*, Series III, 1887, 55 pages, 12 pl. Upsala, 1888.

H. E. HAMBERG. Die Sommernachtfröste in Schweden 1871-1900. — *Mémoires de l démie Royale des Sciences de Suède*, Vol. 38, No. 1, 94 pages, 5 pl. Stockholm, 19 The memoir contains also average dates for certain epochs in the development of tation, especially in their bearing on agriculture.

H. E. HAMBERG. Moyennes et extrêmes de la température de l'air en Suède 1856- Supplément aux Observations météorologiques Suédoises publiées par l'Académie R des Sciences de Suède, Tome 49, 2e série, Vol. 35, 1907, 81 pages, 20 pl. Upsala, 19

H. E. HAMBERG. Les Pluies en Suède de 1860 à 1910. — Supplément aux *Observations téorologiques Suédoises*, Vol. 52, 1910, 215 pages, 16 pl. Upsala, 1911.

Composition and Agricultural Value of the Arable Lands in the Argentine Republic.

Part I: Provinces of Buenos Aires and Santa Fé.

by

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GENERAL CONSIDERATIONS.

The vast territory of the Argentine Republic, estimated at 1 139 800 uare miles, extends from 21° to 54° S., that is to say from the tropics the southern cold zone. It possesses a mountain system occupying a atively limited area; this consists of the great mass of the Andean rdillera, the principal summits of which mark the boundary line on e west between Argentina and Chile.

Apart from the important groups of mountain chains connected with d nearly parallel to the system of the Andean Cordillera, which occupy e provinces of Jujuy, Salta, La Rioja and a part of Tucuman in the north, ly a few isolated massifs occur in this immense country; such are those the centre of the country in the north of the provinces of San Luis and Cor- ba and some sierras of less importance in the south of the province of uenos Aires. The rest of the country consists of immense plains called pampas", the monotony of which is only relieved in certain districts slightly elevated undulations, or in the more sandy regions by some nes fixed by vegetation or by others still shifting.

The alluvial soils of which these plains are formed sometimes attain considerable depth, as in the north and centre of the province of Buenos ires and the south of Santa Fe and Cordoba; no pebbles occur in them, d most of them, at least in the upper strata, contain no "fine gravel"; is only in exceptional cases that the whole of the soil will not pass rough a 1 mm. sieve. They are in general rather fine soils, the "coarse nd" being almost always inferior in quantity to the "fine sand;" the ay content is very variable, and in consequence the soils vary from very eavy to very light, and some are even shifting.

A good idea of the distribution of the soils in the most cultivated part f the country—the part which we are going to describe (1)—may be had by

(1) It comprises the provinces of Buenos Aires, Santa Fe and Córdoba, the Pampa ritory, and the provinces of San Luis, Mendoza, San Juan and Santiago del Estero, a total of about 300 million acres.

starting from Buenos Aires and turning towards the west, following for example the Pacific railway which crosses the country almost in a straight line for a distance of about 650 miles ; in a belt along the coast the soil is found to be fairly heavy, becoming gradually lighter as the boundary between the provinces of Buenos Aires and Cordoba is approached ; in the south of this province and in the province of San Luis it becomes sandy, as it does also, though to a lesser degree. in that of Mendoza. It is the same in going from Buenos Aires into the south-west of the province and as far as the Central Pampa, but matters change on travelling northwards parallel to the Rio Parana : thus the somewhat heavy soils of the south of the province of Santa Fe become stiffer towards the north of the same province; they are then clay soils, sometimes even plastic clays, such as are met with also in a great part of the Chaco and of Formosa, regions covered with forests particularly of " Quebracho colorado ".

Province of Buenos Aires. — The province of Buenos Aires, by far the most inhabited and the most highly cultivated of the whole Argentine, has an area of about 75 million acres, of which some 17 per cent., or 12 850 000 acres (1) are sown to wheat, oats, maize and flax, which are the chief crops of the country. Though the rest of the country is covered with natural grassland or put down to lucerne (2) and is kept chiefly as grazing land, it must be mentioned that there are many soils suitable for arable farming and that only a small part of the lands capable of yielding abundant crops are at present under the plough. Nevertheless every year the acreage of tilled and sown land increases to a remarkable extent; but it must also be said that a good many soils which are too light and unsuitable to wheat are cultivated and this, together with unsufficient tillage, contributes in a large measure to lower the general average of yield.

The production of cereals is by no means uniformly distributed throughout the province ; it is on the contrary pretty much restricted to a belt bounded on the north and west by the provinces of Santa Fe and Cordoba, and on the south and south-west by a line slightly curved to the south, which, starting from a point somewhat lower than Buenos Aires, makes an angle of about 60° turned to the south with the meridian of the above town. In fact, out of the 9 400 000 acres under wheat, flax and oats in this province 4 570 000 belong to this belt, which includes a total area of about 21 550 000 acres. Wheat alone occupies 2 565 000 acres, while oats has 885 000 and flax 1 194 000 acres ; if to these crops be added maize, which in the whole province is grown on 3 460 000 acres, of which 70 per cent. or 2 430 000 acres belong to this belt, the cultivated area of the belt amounts to 36 or 37 per cent. of its total acreage.

These figures show clearly that the province of Buenos Aires may be divided into two parts : one comprising the northern and north-western

(1) These figures are published by the Board of Statistics and of Rural Economics of the Ministry of Agriculture and correspond to the crops of 1911-12.

(2) There are about 5 million acres under lucerne in the whole province.

ts prevailingly devoted to field crops, of which we have above roughly tched the boundaries, whilst the other more southern and much larger t, 52 585 000 acres in extent, is chiefly devoted to live-stock breeding. this area only 4 870 000 acres are sown to wheat, oats and flax, and 30 000 to maize, or a total of 5 900 000 acres, which amounts to only per cent. of the whole acreage of the southern belt.

This distribution of agriculture in the province under discussion depends dently to a great extent upon the nature and composition of the soil d subsoil; the best soils for crops are undoubtedly to be found in the rthern part.

The alluvial beds in this belt are of great depth; the subsoil consists yellowish or gray clay, mixed in variable proportions with silicious sand, ; very permeable, which however weathers easily in contact with the air l rapidly gets loosened by tillage; it possesses the peculiar character- c of permitting vertical cuttings to be made in it without any danger of ring in. The wells in this belt, and there are some which are quite an- nt, have been excavated to depths which attain 80 feet and have never en lined with masonry. On this clay, which sometimes contains small antities of gypsum, rests a black humiferous layer 24 to 32 inches deep. is layer is not homogeneous; the arable soil for a depth of 12 to 20 inches n general less compact than the underlying stratum; the latter (or subsoil) often very compact, and is in any case more clayey and consequently less meable than the surface soil. The particles forming these two layers, ich are the ones of special interest to the farmer, are very fine.

According to numerous analyses made, following Schloesing's method, the Laboratory of the Ministry of Agriculture, and upon which this paper ased, samples from the upper layer to a depth of about 12 inches show roportion of sand varying between 70 and 82 per cent. and of clay (silt d clay) between 12 and 25 per cent. They are somewhat heavy soils, ich however can be ploughed without difficulty, even those which contain most clay. They are for the most part sufficiently permeable; their our when they are dry varies between gray and deep gray according to quantity of humus present, which frequently amounts to 25 and 35 per t. and often corrects the defects due to the excess of clay.

In general these soils are well provided with the elements of fertility; rogen, potash and phosphoric acid, though of the latter the content these soils is frequently below 1 per thousand; they are all poor lime, the maximum not exceeding 10 to 12 per thousand, of which out two-thirds is soluble in 2 per cent. nitric acid in the cold. In spite their low lime content and the presence of large quantities of humus, se soils present in general an alkaline reaction to litmus paper; this is en due to the solubility of the very basic alkaline silicates that they con- n. On the other hand, the presence of these alkaline salts in the soil tributes to render it more compact; it has then a marked tendency to k under the action of the rain.

It is doubtless also partly due to the comparatively ready decomposition these silicates that sodium bicarbonate is present in almost all the under-

ground waters and in many superficial ones (lagoons or "arroyos"), i which the carbonate is also found.

Summing up, one may say that if it were a question of improving th soil, the addition of lime would be advisable as it would produce excelle effects. As for manures, the use of which is extremely limited in the countr the most advantageous would be phosphates, especially under the form basic slag.

The subsoil in many cases lacks permeability, the result being th depressions without natural outlets get converted into more or less perm nent sheets of water; this could easily be avoided by providing an outl for the rainwater.

It is especially in the belt near the Rio de la Plata, to the south of t Federal capital, that these facts are observed, because the amount of cl in the soil and subsoil diminishes as one proceeds westwards. As a furth illustration, we give in Table I some analyses of good soils of the northe and north-western belt.

Anyhow, in the greater part of this belt the soil presents no serio difficulty to tilling operations, and the permeability of the subsoil, som what defective in the most clayey parts, improves considerably on bei suitably worked. These soils, on account of their physical charact and geographical position, will certainly be the first to be submitted to t intensive cultivation of cereals and flax. It must also be taken into accou that they are entirely within the belt corresponding to 800 and 600 mm. (3 and 23.6 inches) of yearly rainfall.

At present the average yield of wheat is about 12 bushels (of 60 lbs per acre in the north of this belt and reaches 15 bu. in the rest; these yield the former especially, are not high, but it must be remembered that w are dealing here with extensive cultivation, upon which is bestowed t least possible amount of labour and no manure. In the most northern pa of this belt about one-fifth of the acreage under wheat attains an averag yield of 22 bu. per acre; whilst in the most southern part this yield given by about one-third of the land under wheat, and on one-eighth the area it even reaches 30 bushels.

Besides cereals, this belt is very suitable to the production of fru especially dessert grapes, and of vegetables, for which for a fairly gre distance round Buenos Aires and other centres of population there wou be no lack of manure, which is only now beginning to be used and th to a very limited extent; but in these somewhat compact soils, poor i lime, abundant manuring would not be advantageous unless a fairly abu dant liming were previously resorted to. The rest of these lands form goo natural grass devoted to grazing. Notwithstanding their relative pover in lime, lucerne gives excellent results; it is really the only forage pla that is grown in the country, succeeding in almost every locality in whi the rains or the natural moisture of the soil are sufficient.

To the south of the line, which for lack of natural landmarks we call t limits of the northern belt, the rest of the province of Buenos Aires may aga be divided into two parts: a central one which includes about 20 558 8

	I		II		III		IV			V		VI	
	S Brown	S' Yellowish brown	S Brown	S' Yellowish brown	S Brown	S' Yellowish brown	S Brown	S' Yellowish brown	S'' Yellow	S Dark gray	S' Yellowish gray	S Dark gray	S' Yellowish gray
Fine gravel . . . . . %	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse sand . . . . . »	17.10	9.50	2.66	2.07	42.10	38.10	13.20	2.80	6.00	25.20	26.70	55.51	63.27
Fine sand . . . . . »	55.20	56.70	77.56	70.98	41.10	40.20	74.00	51.20	61.20	58.10	48.40	30.10	24.90
Total sand . . . »	72.30	66.20	80.22	73.05	83.20	78.30	87.20	54.00	67.20	83.30	75.10	85.61	88.17
Clay . . . . . »	24.60	31.70	17.30	24.40	12.60	18.60	10.20	41.80	29.70	12.40	23.30	7.95	9.31
Humus . . . . . »	0.80	0.20	1.40	0.80	3.00	0.80	0.90	0.70	0.20	3.00	0.50	2.20	0.50
Organic detritus and soluble matter »	2.30	1.90	1.08	1.75	1.20	2.30	1.70	3.50	2.90	0.40	0.60	4.25	2.02
Nitrogen . . . . . ‰	1.48	0.76	3.12	1.34	2.66	1.06	1.81	1.25	0.62	2.51	0.99	1.94	0.80
Total lime (CaO) . . . . . »	5.80	5.46	7.11	5.46	9.74	8.23	4.10	4.26	11.65	8.20	6.73	7.76	6.41
Soluble lime . . . . . »	3.98	3.92	5.32	3.86	5.43	3.75	1.96	2.41	7.50	2.86	3.58	1.75	2.32
Potash (K_2O) . . . . . »	7.82	8.19	4.96	5.64	4.79	5.18	5.83	11.34	11.54	5.87	6.62	3.82	3.40
Phosphoric acid . . . . . »	1.29	0.81	1.71	0.88	1.32	0.75	0.88	1.12	1.60	1.50	0.82	1.13	0.50

S = Soil — S' = Subsoil — S'' = Second subsoil.

acres, of which 3 169 900 acres or 15.4 per cent. are under cereals: wh 2 005 600 acres, oats 649 600, and maize 513 750 acres; hardly any fl is grown.

The characters of the arable lands of this central region resemble tho of the neighbouring belt which we have described, but they become grad ally lighter, especially towards the south and south-west. Some analys giving the composition of these soils and subsoils, as well as their conte of fertilizing elements, are given in Table II.

Many of these soils may be classed as good loams, the others as ligh that is they are very easy to till and very permeable. The average yie of wheat is very low, rarely above 7.7 bushels (of 60 lbs.) per acre. The soils are nevertheless well provided with the elements of fertility excep ing phopshoric acid, the amount of which is frequently inferior to 0.80 p thousand. They are also poor in lime, rarely containing more than 10 p thousand. The arable soil rests on a subsoil much less compact than in th north-western belt, and which often differs but little from the soil and consequently very permeable. Nevertheless, if one examines the map this region, as well as that of the sea-coast of which mention will be mad further on, one is struck by the number of more or less permanent lagoo scattered over the surface. Almost all of these lagoons are due to th presence of an interrupted bed, without any appearance of stratification, a kind of pan, called "tosca" in the country; it is an impermeable concr tion, more or less ferruginous and containing lime, generally thin, but som times attaining a thickness of 16 feet. It is situated at varying depth and frequently in low-lying parts crops out at the surface. This forma tion (1) is rather widely distributed in the country; it exists also in th northern belt, but often at a certain depth, forming in the gray and yello clays discontinuous lenticular areas upon which the water accumulate forming the first sheet of underground water. The belts in which "tosca is at a slight depth are only adapted to natural grassland; in the othe parts lucerne grows very well.

Though live-stock breeding will prevail in this region, there are man soils in it suitable for growing cereals, as well as potatoes, which do admi ably in the lighter parts.

In the rest of the province, that is the part along the Atlantic, whos area may be estimated at 32 million acres, only about 2 ½ million acr are sown to cereals. This is the region of sandy soils, with but slight coh sion, some of them shifting sands, as towards Bahia Blanca.

These lands are mostly covered with natural grassland and lucerne fields the latter are found wherever the depth of the soil and of the subsoil allo it, in the higher parts of the undulations, where the "tosca" is at a suffi cient depth not to interfere with the root development of the plants.

Such are in broad lines, the principal characters of the soils and sub soils encountered in the province of Buenos Aires. But it will be easil

(1) It constitutes one of the characteristics of the Pampean system.

	I		II		III		IV		V	
	S Grayish black	S' Gray	S Dark brown	S' Yellow	S Light brown	S' Yellowish brown	S Grayish brown	S' Yellowish brown	S Black	S' Yellowish brown
Fine gravel . . . . . %	0	0	0	0	0	0	0	0	0	0
Coarse sand . . . . . »	23.70	34.20	49.80	64.40	78.80	83.00	26.90	21.90	10.80	14.20
Fine sand . . . . . »	61.44	50.83	39.60	29.00	16.30	12.10	60.70	59.70	67.17	61.48
Total sand . . . %	85.14	85.03	89.40	93.40	95.20	95.10	87.60	81.60	77.97	75.68
Clay. . . . . %	9.90	13.50	4.30	6.00	3.60	4.10	10.60	16.00	19.00	22.90
Humus . . . . . »	3.20	0.60	3.00	0.10	0.50	0.20	1.60	0.60	2.60	0.60
Organic detritus and soluble matter . . »	1.70	0.86	3.30	0.50	0.70	0.60	0.20	1.80	0.43	0.82
Nitrogen . . . . . ‰	3.13	0.75	3.32	0.50	0.73	0.56	2.59	1.12	2.86	1.08
Total lime (CaO) . . . . . »	4.76	3.83	7.81	5.81	6.83	6.83	6.94	7.00	11.79	15.82
Soluble lime . . . . . »	4.69	2.45	3.98	1.12	1.90	1.74	3.36	3.36	6.65	10.15
Potash (K_2O) . . . . . »	4.22	2.34	4.22	4.08	3.02	3.04	4.08	5.03	5.44	6.77
Phosphoric acid. . . . . »	1.44	0.55	1.13	0.32	0.95	0.82	0.77	0.46	1.46	1.10

S = Soil. — S' = Sub-soil.

understood that the limits of the areas covered by these various types, whic we have just described, cannot be given otherwise than approximatel In this immense plain the changes in the characters of the soil are far fro being sharply distinguished from each other like soils resting on the geol gical formations from which they are derived; we will add that there a no areas of any importance which contain only one and the same type soil. As we have already observed at the beginning of this paper these a alluvial soils, the mineralogical constituents of which have not, as far as w know, been investigated, but which seem to present very slight differenc from one point to another, but which from an agricultural point of vie differ in their greater or lesser content of clay and also of humus, that to say chiefly in their degree of cohesion and of permeability, which chan gradually from one point to another.

Province of Santa Fé. — It is needless to say that the boundaries the provinces do not constitute limits to the types of soil; these are almo always the same in the borders of neighbouring provinces; thus in the sou of the province of Santa Fé on the northern boundaries of the province Buenos Aires, the arable lands are similar to those of the northern belt of t latter. These lands in the province of Santa Fé form a total of 12 972 5 acres, of which about 53 per cent. are sown to wheat, oats, maize and fl The total area of this province is estimated at 32 450 000 acres, so that th under cereals and flax is about 7 336 000 acres, of which 6 847 000 acre or 93 per cent., belong to the southern belt.

Here also, on a considerable depth of alluvial soil of the same natu as those already described, the same humus layer, sometimes 3ft. deep, found; with it occurs a somewhat heavier superficial layer on a more com pact subsoil containing more clay; these characters are still more marke along the Rio Parana, and diminish towards the west and south-west.

Like the north and west of the province of Buenos Aires, the southe part of that of Santa Fé is one of the oldest under cultivation; as a example of the composition of its soil and subsoil some analyses a given in Table III.

The analogy between these soils and those of the neighbouring be is evident; they are likewise generally well provided with humus, nitrog and potash, with perhaps a somewhat lower content of phosphoric aci but they are all poor in lime.

In general, under this arable layer, about one foot or more de another blackish layer is found: this contains more clay and is often b little permeable, but becomes more so on going towards the north. Neve theless, in the northern part of this province there is also a fairly importa area in which the soil, of average or slightly heavy nature and sometimes ev very light, rests on a very clayey and almost impermeable subsoil, contai ing 38 to 45 per cent. of clay (silt plus clay).

In the most northerly part of this same province, bordering on the Chac are found only blackish or gray, more or less deeply coloured, very plast clays, which crack on drying and become very hard; these lands cann be used except for grazing. These two belts represent about 19 478 0

TABLE III. — *Analyses of soil. Province of Santa Fè.*

	I		II		III		IV		V	
	S Reddish brown	S' Reddish brown	S Dark gray	S' Yellowish gray	S Yellowish grany	S' Yellow	S Gray	S' Yellowish brown	S. Gray	S' Grey black
Fine gravel . . . . . %	0	0	0	0	0	0	0	0	0	0
Coarse sand . . . . . »	18.50	14.20	10.90	13.00	4.60	2.30	2.20	1.30	3.40	2.50
Fine sand . . . . . »	59.00	42.40	69.50	57.40	66.60	56.70	82.53	61.14	47.84	48.86
Total sand . . . »	77.50	56.60	80.40	70.40	71.20	59.00	84.73	62.44	51.24	51.36
Clay . . . . . »	20.00	41.30	17.00	27.00	25.90	38.70	12.50	35.40	47.00	46.40
Humus . . . . . »	1.50	0.10	1.20	0.70	0.90	0.30	0.50	0.20	1.10	0.50
Organic detritus and soluble matter . . »	1.00	2.00	1.40	1.90	2.00	2.00	2.27	1.96	0.66	1.74
Nitrogen . . . . . ‰	1.60	1.15	2.93	1.37	1.30	0.74	0.98	0.69	2.16	0.49
Total lime (Ca O) . . . . . »	5.40	6.97	8.85	7.00	6.92	8.40	3.53	5.91	4.84	3.64
Soluble lime . . . . . »	3.47	4.98	5.54	3.86	3.86	5.21	2.38	3.50	3.64	2.59
Potash (K_2O) . . . . . »	6.20	7.33	7.54	7.22	6.21	6.93	6.53	10.06	9.05	9.54
Phosphoric acid . . . . . »	0.94	0.94	2.45	1.38	1.21	1.29	0.51	0.78	1.00	0.77

Analyses Nos. I, II, III: Southern part; No. IV: Central part; No. V: Northern part. — *S* = Soil. *S'* = Subsoil.

acres, of which about half belongs to the intermediate belt which is cultivable at many points.

The provinces of Buenos Aires and Santa Fé are especially favoured on the one hand by their geographical position in proximity to the Parana and La Plata rivers, which border their greatest length, and on the other by their climatic conditions, which ensure them an abundance of rain equally distributed throughout the whole year, so that they do not need irrigation ; there exists here an unbroken area of nearly 34 ½ million acres of very good soils suitable for most crops, and which, in order to yield good harvests and satisfactory economic results, do not in general require for the moment anything beyond tillage suitable to the nature of the soil and subsoil.

Of course, as has been stated, there are also lands exhausted by an exclusive and continuous production of wheat and flax during many years (20 or 25 years and even more) without any manuring; but a more systematic farming, and the use of green manuring in default of other manure, would soon change this state of things, especially if liming were resorted to, using for the purpose the deposits of limestone which are found in large quantities near the Rio Parana on the shore opposite Santa Fé, near the city of this name, without mentioning the important beds of small mollusc shells which have accumulated chiefly along the banks of the Rio de la Plata.

Anyhow, these exhausted lands occupy only a relatively limited area when compared with that which remains to be or has only recently been brought under the plough.

To this vast extent of 34 ½ million acres must be added another and not less interesting one which forms the central part of the province of Buenos Aires and comprises 20 560 000 acres. It also includes some good soils, which, though generally lighter than those of the north-western and northern belts, are capable of giving good crops of cereals. This is a region of mixed farming, that is including live-stock breeding and dairying, whilst further south, along the coast up to Bahia Blanca, breeding will always prevail.

The intermediate belt of the province of Santa Fé is at present but little cultivated ; it could, however, be profitably cropped in many places where the soil is deep enough and the subsoil less impermeable, if it were not for the almost absolute lack of superficial and subterranean water suitable for human and animal consumption (the water found even at great depths being brackish). This is general throughout this region up to the Chaco (Chaco Santafecino) and in the neighbouring one, both to the south-west in the province of Santiago del Estero (Chaco Santiagueño) and to the north-west in that of Salta (Chaco Salteño).

The Study of Agricultural Geology in Italy

by

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The object of this paper is to give a brief account of what has been lone in Italy in the geological investigation of the soil, to form an introluction to the bibliography which follows.

In this paper and in the bibliography, agricultural geology is taken only n connection with the study of the soil; thus everything concerning the vater supply, and especially the underground water, is excluded. This ubject is of the greatest importance for agriculture, and forms a part of ı distinct chapter of applied geology. It may be treated separately.

With this attempt at grouping together everything that has been done n Italy in the matter of geological research in connection with agriculture, I do not claim to have drawn up a complete survey and bibliography. Thus, r instance, I have deliberately excluded those works of a too markedly ıemical character (1), all the general geological descriptions in which the gricultural conditions of the regions described are considered, but too incintly, and lastly all strictly phyto-geographical works (2).

Italy had given some fine examples of the application of geology to griculture in Gemellaro's works (Bibl. 46), which date back to 1825, if ideed the classical works of Filippo Re, though prevailingly agricultural, e not taken as the earliest, for Re already in 1809 demonstrated the imortance of the study of the soil.

The above were followed, still early in the nineteenth century, by the orks of Giuli (Bibl. 51), Cuppari (Bibl. 19-22), and Savi (Bibl. 84,85). hen for a long time no geologist took interest in agriculture, nor were there griculturists sufficiently versed in geology to apply this science with advanige to the study of the soil, which during this period had remained the ndisputed domain of agricultural chemists, who enriched it by important ontributions.

About 1890 the study of agricultural geology began to be taken up gain in Italy, thanks to the professors of agriculture and to the agricultural

(1) Such as the following works:

SESTINI F.: Il terreno agrario. — *Enciclopedia agraria italiana*. Turin, 1899.

SESTINI, F.: Materiale per una carta chimico-agronomica dei terreni della pianura sana, ecc. — *Atti Soc. Tosc. Sc. Nat.*. Pisa, 1903.

(2) Such as the fine general part of L. M. GORTANI'S work: *Flora della Carnia*. dine, 1904.

institutions and associations, among which the following deserve especial mention: the Association of Italian Agriculturists, the Royal Academy of the Georgofili, the Agricultural Society of Friuli, and the Antiphylloxera Association of Brescia. From this period a fairly abundant and very important literature on the subject begins to flourish.

As may be seen from the annexed bibliography, the Italian works on agrogeology may be divided into various groups.

For educational purposes some treatises were and still are used. Besides the older works (Bibl. 18, 44), in 1898 Parona's book (Bibl. 69) appeared; in this the general geological part, always treated with special reference to agriculture, is followed by interesting information on the soils of the several provinces of Italy, some of it compiled by the writer himself, the rest being due to his collaborators (Bibl. 5,38). This work has remained up to the present the only source from which a general idea of the soils of the several regions of Italy could be drawn.

A second and more recent compendium (Bibl. 114) is of a different type being a guide to the course of agricultural geology held in the Royal College of Perugia. Besides treating of the soil, it treats also of the waters, because in the opinion of the writer pedology and hydrology form an intimately connected whole and make up the real agricultural geology.

The good handbook (Bibl. 116) of Vallardi's agricultural library devotes itself more to the soil (1).

The monographs on the agricultural geology of individual regions are numerous. Among these, that on the Montello (2) is excellent (Bibl. 91) very praiseworthy also are those which describe the soils of Friuli (Bibl. 35, 41, 42, 101 and 102), those of Brescia (Bibl. 16, 17), of the territory of Grotte di Castro (nr. Viterbo, prov. Rome) (Bibl. 66) of Rosignano marittimo (prov. Pisa) (Bibl, 110), of Casalina (prov. Perugia) (Bibl. 12).

Nor are studies on our colonies wanting. One on the soil of Benadir appeared this year (3). while from the same author a work appeared some time ago on some soils of Eritrea. The soils of Lybia have already been the subject of some studies (Bibl. 58, 113, 119, 120), among which the principal is that on the soils of Tripoli due to a commission appointed by the Government, which confirmed what the writer had already demonstrated in 1911 (Bibl. 113), namely that the so-called desert round the oasis of Tripoli consists of the same types of soil which form the oasis itself and cannot therefore be considered as a real desert, but must be looked upon as cultivable land.

Geology has been called upon also in the land registration work. Already the old land registration contained brief notices on the nature

(1) Completed from the hydrological point of view by the following work: PRINCIPI, P. *Idrologia agraria*. Milan, 1912.

(2) A wooded district near Montebelluno, prov. Treviso. (*Ed.*).

(3) PRINCIPI, P. Osservazioni sui terreni agrari della Somalia italiana. — *Giorn. Geologia italiana*. Parma, 1913.

the Italian soils. On the reorganization of the office of agricultural statistics by Ghino Valenti, it was ordered that every agricultural region in the land register should be accompanied by summaries of the geological formations which make up the region. Surveys accompanied by such notices have already appeared for Latium, the Marches and Umbria (Bibl. 57), while those of Lombardy, Tuscany and Piedmont are in the press.

Geology has also been used as a base in the valuation for land registration, but works of this kind are not numerous, being limited to one on the province of Verona (Bibl. 64) and one on that of Cuneo (Bibl. 59).

A very important subject, that of agrogeological maps, has recently been much discussed and treated in Italy. Stoppani and Taramelli also called the attention of the Government to the matter, and in 1880 proposed a bill for the preparation of these maps. In 1896 the Society of Italian Agriculturists took up the question with energy. The Geological Bureau, however, being occupied with the surveys for the geological map of Italy, could not undertake this new work, and so the matter of the State agrogeological maps was allowed to drop. There were, it is true, several praiseworthy attempts on the part of Associations (Bibl. 15-17) and of private persons (Bibl. 3, 6, 12, 13, 35, 41, 42, 66, 91-93, 101, 102, 104, 105, 108, 110), who draw up valuable maps on their own account. But, as could have been foreseen, these maps were wanting in the uniformity which could only be given by an official scientific commission, and they turned out very unequal owing to the different views of the various authors or to the objects for which they were made. But this is no great harm, because when the organization of the agrogeological map, which becomes a necessity, is undertaken, several types of maps will have already been tried and among these a judicious choice can be made.

After all, the general criteria for drawing up these maps have been amply discussed (Bibl. 1, 71, 78, 79, 90, 99, 111, 112, 121, 122, 124), so that it will be fairly easy to unify the manner of setting forth the data to be shown by the maps.

Without actually drawing up the maps, several writers have contributed important descriptions of the agrogeological conditions of the various regions of Italy (Bibl. 4, 8, 24-26, 36, 37, 39, 46, 49, 50, 53, 60, 62, 63, 68, 72, 73, 82, 87, 89, 94-98). Nor have important purely scientific researches (Bibl. 27, 31, 75) on interesting questions on the soil and its behaviour been wanting.

In conclusion, it may be said that there is no branch of agricultural geology which has not been more or less extensively treated of in Italy.

The renewed interest in agrogeological study in Italy coincided with the increased importance of the teaching of agricultural geology. It had been considered as a subject of secondary importance in the various Agricultural Colleges and it was taught by the same professors as mineralogy. The College of Perugia was the first to establish an independent course of agricultural geology and mineralogy, which soon became geology and lithology and which is now simply agricultural geology. The example of Perugia was more or less faithfully followed by the other Colleges,

and the new Forestry Institute of Florence has a chair of geology applied to forestry. On this subject also several works have appeared (Bibl. 10, 11, 29, 33, 52, 85, 123).

The new chair and those of the Agricultural Colleges are occupied by capable scientists, young and promising men, so that their labours, completed by that of the Government and of the local bodies, warrant us in trusting that in the field of agricultural and forest geology also Italy is in a fair way to occupy the position which is due to her and which it is her duty to occupy soon.

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The Cultivation of Medicinal Plants in Hungary

by

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The climate and soil of Hungary offer very favourable conditions fo the cultivation of medicinal plants, which has been practised from remot periods, without however attaining the social importance that it has a the present day. During the course of last century some dye plant played a very important part, as, for instance, madder (*Rubia tinctorum* saffron (*Crocus sativus*), woad (*Isatis tinctoria*), dye-hollyhock, etc.; the

en chemical products took the place of these plants, this branch of ming lost its primitive importance and the cultivation of medicinal nts was also neglected.

In 1904 the writer proposed the more systematic utilization in Hungary the abundant wild drug plants, the better cultivation of the most valu- e among them, and the institution for this object of an Experiment Sta- n. The same year the Ministry of Agriculture approved of this initiative l founded the Medicinal Plant Experiment Station at the Agricultural ademy at Kolozsvár (Klausenburg).

The Station studies the systematic cultivation of drug plants, deter- nes their value, and studies all the questions concerning them. According he results obtained, it promotes the cultivation of drug plants and assists inners both in the cultivation of the plants and in disposing of them. anks to this service, every day the number of growers of such plants in- ases. Among the pioncers of the movement the curé Joseph Agnelli Csári is especially worthy of mention as a grower and selector. Certain ieties produced by him, such as the *Agnelliana* varieties of *Mentha ipa* and *Mentha piperita*, are much esteemed, even abroad. On the other id Dr. Eugene Szkicsák, chemist at Privigye, has organized the "Car- hia" Company for the cultivation and preparation of medicinal plants. ne large landowners are also beginning to turn their attention to the ing of certain drug plants, such as coriander, the product of which is l abroad for the extraction of the essential oil. Lately also the growing lrug plants had been introduced into prisons, reformatories and deaf-and- nb schools by the directors of such institutions, thus affording useful rk to otherwise idle hands.

The Experiment Station has for the last eight years organized a yearly rse for schoolmasters and the regional clergy, who in their turn spread ong the people the knowledge they have acquired. Besides, the Ministry of riculture arranged courses in 1912 at Zsolna for the schoolmasters of thern Hungary.

Among the numerous drug plants of Hungary the following are espe- ly to be mentioned:

Curled mint (*Mentha crispa*).—Of late years the curled mint of Hungary been in growing demand on the markets of the world, partly on ac- nt of its superior quality and partly owing to the increasing consump- n of the essential oil of mint. Analyses made at the Experiment Station have nonstrated that the essential oil of Hungarian curled mint is charac- zed by its high laevocarvone content: 62 to 71 per cent., against 56 cent. in the oil of American mint, 35 to 56 per cent. in the German oil, l 5 to 10 per cent. in the Russian product.

Hungarian curled mint is especially sought for by the large German firms, export quantities of it to America. It is expected that this exporta- n will soon become very considerable. As for its yield, at least 11 cwt. acre are obtained, and under favourable conditions 18 to 19 cwt. per acre lry crop, which may be valued with the stalks at £1 1s 2*d* to £2 0s 4*d* cwt. The gross yield may thus range from £12 to £40 per acre.

Peppermint (*Mentha piperita*) is cultivated in several regions of Hun gary on greater extents of land. The dried leaves (*folia menthae piperitae*) are used for infusions, while menthol and the essential oil of peppermint (*oleum menthae piperitae*) are still more used. The value of this plant depends upon its menthol content. In this respect Hungarian peppermint is superior to American, for while the former contains 42.88 to 55.9 per cent. of free menthol and 55.38 to 65.19 per cent. of total menthol, the American peppermint contains 40 to 45 per cent. of the former and 59 per cent. of the latter.

Peppermint is cultivated in the Great Hungarian Plain (Alföld), as well as in the north of Hungary and in Transylvania. It is exported in great quantities to Austria and Germany; in 1912, however, the trade in this drug was not so brisk as in curled mint. Peppermint yields from 7 to 10 cwt of dry herb per acre worth about £1.14s to £2.2s per cwt., so that the gross returns from an acre range from £12 to £21.

Balm (*Melissa officinalis*) is grown in some dry localities of Hungary. At the Station the cultivation of this plant has succeeded admirably and the farmers of Upper Hungary and of the Alföld have obtained good results. On the whole it may be said that Hungary produces a fine and very aro matic balm, the climatic conditions of our country suiting it very well. It is not consumed to the same extent as the mints. According to experiments made at the Station, a revenue of about £23 per acre, after deduction of the cost of labour, may be expected from it.

Sage (*Salvia officinalis*) grows in similar conditions and is cultivated in gardens. It is a native of the South of Europe, where it grows wild and whence great quantities are sent to the markets of the world. Though it is exported from Italy and Dalmatia at a very moderate price, its cultivation is profitable, as the cultivated plant is more esteemed.

Clary (*Salvia Sclaria*) is also grown in Hungary. Its flowers and leaves are in great demand for their strong smell and aromatic flavour and are used especially for doctoring wines. Most of it goes to Germany.

Sweet marjoram (*Origanum Majorana*) is being increasingly grown in Hungary. It is sent to the Austrian, German and French markets. In Paris the celebrated marjoram of Provence has been compared with the Hungarian product and the latter has been found the finest and most aro matic. It has thus a great future before it in Hungary, especially on the right bank of the Danube and on the Alföld, where it is most cultivated. Marjoram can yield a profit of £12 per acre.

Hyssop (*Hyssopus officinalis*) and rue (*Ruta graveoleus*) thrive well in the dry parts of Hungary, especially on the Alföld, as they are very drought resistant. According to the experiments carried out at the Station, they can yield a yearly income of £11 5s to £22 10s per acre; nevertheless these two plants occupy a very subordinate position in the trade. Most of the exportation is to Austria and Germany.

Several large estates in Hungary grow coriander (*Coriandrum sativum*). Recently, Hungarian coriander has become an important factor in the trade in which formerly Thuringian and Moravian corianders were predominant.

, Sweet fennel (*Foeniculum officinale*). — In the trade Roumanian fennel considered of superior quality and is much esteemed. It is immediately lowed by the Transylvanian fennel. Its oil answers to the demands foreign pharmacopœias.

Angelica (*Archangelia officinalis*) prefers districts with frequent rainfall; is the experiments conducted at Kolozsvár gave very satisfactory results. has also been cultivated in several districts of Upper Hungary.

Caraway (*Carum Carvi*) is cultivated in Hungary by small and large mers, but it cannot compete with Dutch caraway. Anise (*Pimpinella isum*) is not yet cultivated in Hungary on a large scale, though its ential oil answers perfectly to foreign requirements.

Among the Hungarian medicinal plants which do not contain volatile s, marsh mallow (*Althaea officinalis*) deserves to be mentioned first. It ws especially along the Tisza and in the fields along the large rivers, parti-arly on salt lands. Along the Tisza the wild plant is gathered by the people. ere are, however, localities in which it is cultivated; the first year the ts are too small, so that only the leaves and flowers are gathered; in the ond year it gives a crop of roots. In order to utilize the soil better, ts are planted between the rows of marsh mallows. This plant is in nand on the markets of the world; it is exported chiefly to Germany l to Austria, as either crude or prepared roots (cut into cubes).

Hollyhock (*Althaea rosea* var. *nigra*) is cultivated for its black flowers; s used in medicine and as a dye-stuff. At present it does not enjoy the utation that it formerly had; nevertheless it is still cultivated in some ts of Hungary.

Blessed thistle (*Cnicus benedictus*) is much esteemed in therapeutics ler the name *herba cardui benedicti*. It is much used in the manufacture the liqueur called Bénédictine. Its cultivation is very profitable; thus ngary may hope to export great quantities of it in future. According experiments made with this plant at the Station, it is capable of lding a profit of £13 17*s* per acre.

Sweet flag (*Acorus Calamus*) grows in swampy places in Hungary. m its rhizomes and roots the drug known as *rhizoma calami* is prepared. some localities it is planted in swampy grounds.

Marigold (*Calendula officinalis*) and mullein (*Verbascum phlomoides*) e been cultivated in Hungary for some years past for their flowers. e flowers of marigold (*flores calendulae*) are used for the adulteration affron and in the preparation of incense. In France marigolds are used a great scale. The flowers of mullein (*flores verbasci*) are among the st precious and esteemed drugs. For this reason not only are the wild nts, which grow plentifully on the sandy soils of Hungary, gathered, but ently the plant has been cultivated. The cultivation of *Verbascum*, a nial plant which flowers only in the second year, is to be recommended small farmers who have large families in which the children could end to the daily gathering of the flowers and to their careful drying.

Whilst most of these medicinal plants are grown in gardens, the tivation in Hungary of the two varieties of mustard is carried out on

a large scale. The growing of white mustard (*Sinapis alba*) succeeds bett than that of black mustard (*Brassica nigra*) and is consequently mo practised in Hungary. Besides its use in medicine it is grown as green foo

I may mention also the following medicinal plants which are grow in Hungary on a small scale: *Chenopodium ambrosioides, Inula Helenium Ocymum Basilicum, Artemisia Dracunculus, Artemisia Absinthium, Th mus vulgaris, Datura Stramonium, Atropa Belladonna, Anthemis nobil Conium maculatum, Levisticum officinale, Pyrethrum cinerariaefolium Rheum, Tanacetum vulgare.*

The Profitableness of Present-day Sheep Keeping in German especially in comparison with Cattle and Pig Keeping

by

Professor HOWARD, *Leipzig.*

The question of the profitableness of present-day sheep keeping h arisen without doubt from the unprecedented decrease in the flocks the one hand and the increase in the numbers of head of cattle and es cially of pigs on the other.

The live stock census in Germany shows the following returns:

	Numbers of		
Year	Sheep	Pigs	Cattle
1873	24 999 406	7 124 088	15 776 702
(1907)	(7 703 710)	(22 146 532)	(20 630 544)
1912	5 787 848	21 885 073	20 158 738
	Decrease: 19 211 558.	Increase: 14 760 985.	Increase: 4 382 036.

N. B. — The data for 1912 are from provisional communications.

It must also be considered that these figures are the result of the grou ing together of animals of various ages and without account being take of their weight, and that in the census, which is always made in Decembe the calves, lambs and pigs born and slaughtered within the year are no included. In spite of this the figures are very eloquent as to the movemen of the stocks within a period of close upon 40 years.

It appears at first sight that these changes are due to the recognitio of the fact that sheep keeping is unprofitable compared with pig and milk stock keeping.

In reality the question is not so simple. Sheep keeping has had t contend with hard times. The prices of wool have steadily and conside ably fallen (though they have risen again from 1s per lb. in 1894 to 1s 6

½ *lb.* in 1911), and the possibility of selling fat sheep and lambs in France d England, which for a long time had played an important part, has been it. The income from many flocks has thus considerably diminished, it the effect of these causes has been much overrated. Since 1894 the price mutton has again risen, from about £2 9*s* 9*d* per cwt. carcase weight to 3 15*s* 3*d*, and the prospects are that the prices will keep at this level or en rise, for with the increasing prosperity of the population the con-mption of mutton, as can already be seen, increases. There are many her reasons for the decrease in the numbers of sheep in the country: the pid disappearance of fallows and of commons, the increased cultivation field crops, etc.

Unfortunately it must be said that the sweeping elimination of sheep, ough certainly sometimes the result of a careful consideration of all e circumstances, has in most cases been decided upon without that care-l examination which in trade and in the industries is never neglected fore abandoning some particular branch.

A clear vision of the profitableness of a branch of farming can only obtained by careful figuring, and as this is difficult in farming, and many fferent opinions struggle for the mastery, one doctrine which evades all ese difficulties has obtained wide diffusion; it asserts that farming is an ganism from which no part can be separated or eliminated without injur-g the whole; therefore each separate account is not only unnecessary but jurious and misleading.

Thanks to our marvellous progress in scientific knowledge and techni-l improvements, some unexpected increases of gross returns have en granted us. Connected with the endeavour to supply the people ith food raised in the country itself, the increase of intensity in farming is become an axiom, unfortunately without due consideration of the nits of suitableness set for any given case.

It seems almost unnecessary to emphasize the fact that the increase intensity is limited by the conditions obtaining, which cannot be over-epped without causing losses; yet it is just this consideration which is so difficult to get people to recognize. The increased employment of apital and labour depends upon the will of the farmer, who shapes his ourse according to theoretical discussions and the results of experiments, ut the effects hoped for may be limited or fail altogether owing to many iverse causes in the nature of the soil and the climate, or owing to the nditions of the markets.

How is it possible to judge these facts without the most complete con-ol by means of accounts?

A mistake in the fields is punished once in the year with the unsuccess-l crops, while mistakes in stock rearing, which owing to their smallness for ach individual easily pass unnoticed, get multiplied by the number of head nd by the 365 days of the year and can thus grow to such a magnitude hat not rarely the most brilliant results of the field are completely swall-wed up by the losses on the stock, and the farmer finds himself confronted ith a negative total result.

It would be beyond the limits of this paper to enter into the questi of the difficulties of agricultural accounts. They lie principally in the rec procal relations between the fields and the stables. A theoretically perfe solution of these difficulties will perhaps never be found, but the practic way of evading them has long been pointed out; unfortunately it is di cussed by many and followed by too few, because it is tedious, requir much care and causes expenses.

According to the above, it appears that it is impossible to answ the questions that have been raised, owing to the insufficiency of the mater collected. I shall, however, endeavour to give a relatively practical sol tion, but I must first premise the following:

The most recent work of von Telschow on sheep breeding and rear deals also with their profitableess and discusses it with the aid of an exam of sheep keeping in which, according to his opinion, all the widely spre errors which he deplores and which are credited with being the cause lack of success, have been avoided. But as in his account he has failed consider on the one hand the hay, straw and pasture used and on the oth the manure produced in the sheds, his work is only a calculation witho any comtrolling and correcting connection with the rest of the farm. It evident that precisely this want of control (all the more so that in th instance the capital invested in sheep is said to yield 22 ½ per cen interest) is calculated to cause mistrust, dealing as it does with a branch industry which is considered generally as unprofitable. The example miss in this manner the object for which it was intended.

Notwithstanding the difficulties attendant on the solution of the pro lem, I shall endeavour to answer the question which has been put, feelin justified in so doing for the following reasons: I have for the last 40 year with the cooperation of the most eminent and intelligent farmers, strive to investigate with scientific rigour the profitableness of farming and, abov all things, to ascertain the causes of the success or lack of success of th separate parts of the farm which go to make up the whole result. In thi work I have found that the most progressive farmers have taken an eve increasing interest, and, in spite of the criticism of the majority of thei colleagues who held opposite opinions, have in time recognised the erro of too general theories, especially that which considers a farm as an ind visible organism (Organismus theorie).

In my research on the income of the several branches of a farm I hav always sharply separated the questions concerning live-stock keeping fro those dealing with the field crops, and each branch of farming has bee most exhaustively examined, so that a clear idea can be had of each them. This method enables me to treat separately any part of the wor of farming.

Thus already 27 years ago I examined, with the help of my farmin accounts and calculations, the conditions which were considered caus of the extraordinary decrease of sheep keeping, which had already set i The result of this work proved, among other things, that the sale of wool an mutton had in reality nothing like as great an influence as was generall

ttributed to them on the decrease in the numbers of sheep; it proved further hat properly conducted sheep keeping was not only profitable, but could nder suitable conditions surpass the profitableness of milch-cows and pigs.

The interest for these questions has in the meantime much increased, nd two years ago I considered it opportune to attack again the prejudice gainst sheep keeping which had not yet been in any way shaken. I had the dvantage of having much more available material, wich has been collected or the last 20 or 30 years always on the same principles, and has been roved to be correct by the other results of the farm.

I was thus able to establish that the general results of the earlier investigations are generally confirmed by the present ones and that undoubtedly n numerous farms keeping sheep is even now a branch of farming which eserves consideration and that under many conditions it yields more rofit than cow or pig keeping, or at least as much. Nevertheless there are lany farmers who, in spite of the instructive results of their book-keeping, ave less faith in this than in universally accepted opinion, or who from a eneral point of view prefer unlimited increase of intensity of farming in the ope of realizing in the future extraordinary benefits.

The question now arises whether the results of these investigations, hich, however carefully made, still represent only limited sources compared ith the totality, are sufficient justification for conclusions baing drawn as) general conditions. I believe they are, as I am convinced of the correctess of the methods followed and of their results.

I shall give my results here in figures in the hope of supplying some use-il data to farmers.

The following is a case of sheep breeding during a period of 15 years, om 1896-97 to 1910-11, which for want of space is divided into three periods f 5 years each. During the first period 350 sheep gave a loss per head per ear of 4*s* 9*d*; the next five years showed a profit of 1*s* 10*d*, and the last ve a profit of 7*s* 7*d* per head per year, or an improvement of 12*s* 4*d*, taking £ 224 5*s* per year for the whole flock.

In the above, interest on the capital in sheep is calculated at 4 per cent., hat is 8 ¼ *d* per head. Thus a total of 8*s* 3*d* per head per year on a apital averaging 15*s* 8 *d* is equivalent to an interest of 53 per cent. (See able on next page).

This is certainly the best result that I have found. I have, however, xamined with the same care 45 farms, representing altogether 624 sheep-eeping seasons.

The total average shows a loss of 3*s* 10*d* per head per annum. The best esult was a gain of 4*s*, the worst a loss of 12*s* 11*d*.

If rhe last five years are considered separately there is a slight improve-ient, as the loss is reduced to 3*s* 3*d*. It is satisfactory to note the individual ood results, the best of which shows a profit of 8*s* 7*d*. Unfortunately for the easons given above, and notwithstanding higher prices for wool and sheep, ome farms have allowed their losses to grow, reaching as much as 15*s* 9*d* er head per annum.

DR: *Summary of the Sheep-keeping Accounts of Farm No. 7/1912. From 1896-1897 to 1910-1911.*

Year	Average number of head	Average value at beginning of year	General expenses consisting of						Expenses	Wages	Total expenses up to this point	Fodder	Litter (straw)	General total	Profit per head
			Management	Insurance	Rent of buildings	Rent of plant	Interest	Total							
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1896–97 to 1900–01. .	351.7	15 7.10	0 3.06	0 0.24	2 11.28	0 1.53	0 7.64	3 11.75	0 3.65	3 0.93	7 4.32	16 4.63	2 4.58	26 1.52	—
1901–02 to 1905–06. .	324.–	15 4.87	0 3.76	0 0.24	2 7.16	0 0.71	0 8.58	3 8.45	0 5.29	2 11.63	7 1.38	13 2.76	2 10.34	23 2.48	1 10.00
1906–07 to 1910–11. .	382 5	15 4.87	0 4.00	0 0.24	2 2.70	0 2.00	0 8.82	3 5.75	0 5.88	3 3.04	7 2.67	15 0.52	2 3.64	24 6.82	7 7.38

CR:

Year	Disposed of by sale, etc. — head	Sale price per head	Slaughtered — head	Died — head	Effectively sold — head	Wool and skins per head	Manure per head		Average value at end of year	Loss per head	Wool — per lb.
							in lbs.	in value			
		s. d.				s. d.		s. d.	s. d.	s. d.	d.
1896–97 to 1900–01. .	164	26 7.17	4	32	128	3 11.63	3 245	5 9.38	15 3.46	4 9.27	4 3/8
1901–02 to 1905–06. .	156	29 0.21	1	13	142	4 5.74	3 168	5 7.74	15 8.98	— —	5 1/2
1906–07 to 1910–11. .	212	36 2.06	1	10	201	5 7.03	3 694	6 6.91	15 0.28	— —	7

In the above calculations the interest on the capital (taken at 1s. as
l average figure) has always been added to the expenses.

A comparison with the profits of pig keeping leads to the result that
is branch really yields relatively larger profits where the farmer has the
ility to profit by the quicker turnover of his capital and of the brisk trade
young pigs, which, especially for small farmers, are so much easier to
spose of than lambs.

On the other hand, when the interest and the ability of the farmer are
cking, the losses on pigs are greater than those on sheep. The total losses
l pigs, however, in comparison with those on other branches of farming,
spite of greater losses per head, are not sufficiently considered, as these
imals are generally kept in smaller numbers and to a certain extent
a secondary industry, mostly for consumption in the household itself.

In the year 1912 I examined 36 farms keeping pigs, representing to-
ther 563 years of accounts, and found that the average results were a loss
12*s* 4 ½*d* per head per year. Considering only the last 10 years, the aver-
e loss is reduced to 9*s*. A calculation of the interest was not advisable,
l account of the constantly changing ages of the animals.

As for cow keeping, a comparison with sheep keeping is difficult, as
e manner of keeping them varies so much more than with sheep, as
e chief product (milk) and the way it is utilized cause the whole charac-
r of the farm to vary.

According to my investigations, cow keeping is liable to much greater
ses, which in reality frequently occur. The examinations of accounts
ve led more easily and quickly to improvements, as in cow keeping the
eater part of the returns are received daily, and a comparison with the
penses is so much easier to make.

I refer here, as a striking illustration, to the figures given in my book
andwirtschaftliche Buchführung 1903, I, page 23) in which the cost of the
oduction of milk is worked out from the accounts of 603 farms. The
erage cost price is 6.9*d* per gallon, while the net price realized is 5.2*d*
r gal., the loss being consequently 1.7*d* per gallon.

As at present the conditions of the sale of milk have not materially
proved, except in some centres, and the number of cows has not increased
any notable extent, as statistics show, I can without hesitation use the
ove data for the discussion of the profitableness of cow keeping. Premis-
g that about 10 million cows yield an average of 1.1 gallon of milk per
ad per day, or 4015 million gallons per year, the loss of 1.7*d* per gallon repre-
nts a total loss to German agriculture of about £28 500 000 per annum.

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SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES.

– **New Legislation on Fertilizers, Feeding Stuffs and Insecticides in The State of New Jersey.** – *Thirty-third Annual Report of the New Jersey State Agricultural Experiment Station and the Twenty-fifth Annual Report of the New Jersey Agricultural College Experiment Station for the Year Ending October 31, 1912, passim.* Union Hill, N. J., 1913.

In the United States, 41 out of the 52 States possess legislation on the ade in fertilizers and almost always also on feeding stuffs, insecticides d seeds. After Massachussets in 1872, New Jersey was the second State pass a law on the inspection of fertilizers. (Cf. *The American Fertilizer nd Book*, 1913, p. 92 ; and *Cyclopedia of American Agriculture*, Vol. IV, gislation Relating to the Trade in Fertilizers, pp. 515-518). (1)

The old fertilizer law of 1874 served its purpose well in protecting the mers of the State against fraud in the purchase of plant food. Not only s it been a means for preventing the adulteration and misbranding of com- rcial fertilizers, but it has also served an educational purpose in acquaint- the users of these materials with the sources and agricultural value of the rious forms of plant food. Meanwhile, however, as methods of manufac- e were modified and new fertilizer materials were placed on the market, became increasingly apparent that the old law fell short of fulfilling the rpose for which it was created. It thus became necessary to revise it, d this was accordingly done. The new law (Chap. 179, Laws of New sey, 1912) will enable the Experiment Station by means of its chemical viser, called the State Chemist, to make a more thorough inspection of fertilizers sold in the State. It will give more ample protection both

(1) For the new Swiss law on the same subject, see No. 1313, *B.* Dec. 1913.

to the farmer and to the legitimate manufacturer of fertilizers. Having been placed on a licence basis, the fertilizer inspection will permit the employment of a larger number of official samplers and inspectors. Any surplus of the licence fees remaining after the actual cost of inspection has been met, will be used for conducting experiments bearing on the use of fertilizers and the improvement of soils and farm methods in general.

The New Jersey feeding-stuffs law was enacted in 1900. Since then changes have occurred in the manufacture and composition of many brands. New products have also been placed on the market and new definitions have been created by control officials. By mutual agreement, control officials and manufacturers have adopted certain definitions and standards and a uniform feed law has been formulated. The new law constitutes Chapter 218, Laws of New Jersey, 1912. The inspection under this law is also entrusted to the State Chemist and has been likewise placed on licence basis. A more thorough inspection has been provided for, and more ample protection will be afforded to both purchasers and manufacturers of commercial feeding stuffs. The licence fees collected will be used to cover the cost of inspection, and any surplus remaining will be devoted to investigations of feeding stuffs and such other investigations and demonstrations as will serve to further the interests of agricultural practice.

The far-reaching changes introduced within the last five or six years in the manufacture and use of insecticides rendered necessary the revision of the insecticide law of 1906. The revised law constituting Chapter 89, Laws of New Jersey, is practically a copy of the Federal Insecticides Law. An appropriation of $ 1000 per annum has been made for carrying this law into effect. The amount appropriated is not sufficient for meeting the cost of the inspection. It is expected, however, that the general income of the Experiment Stations will be ample enough to meet any deficiency that may arise. Under the revised law, the fruit growers and market gardeners of New Jersey will be more certain to secure the protection and information so essential in the uninterrupted development of their important industry.

Great losses are suffered annually by the farmers of New Jersey on account of the poor seed purchased by them. The need of some guarantee that would help the purchaser to secure seeds relatively free from weed seeds and possessing a high germination coefficient was keenly felt by the farmers of New Jersey, and the director of the Experiment Station was instrumental in framing a measure that promises to afford the relief sought. The seed law as passed, constituting Chapter 157, Laws of New Jersey, 1912, will permit the Experiment Station to collect samples of seeds sold in the State, to test them for germination and purity and to publish annually the results of the seeds inspection. Residents in the State will have the privilege of having seeeds analysed for them without charge. It is expected that the publicity given in this manner to the seed trade will serve effectively to discourage the selling of inferior seed in the State. The enforcement of the law will be entrusted to a State Seed Analyst.

- Development of Farming in German South-West Africa. — BERTHOLD, HANS in *Landwirtschaftliche Umschau*, Year 5, No. 46, pp. 1051-1053. Magdeburg, November 14, 1913.

Farming has of late years made relatively considerable progress in man South-West Africa; thus, in the district of Windhuk alone the area ler cultivation rose from 230 acres in 1907 to 4606 acres in 1912. Still re important is the progress in live-stock breeding, as may be seen from following table, which gives the numbers of head on April 1 of the rs 1903, 1907 and 1912:

	1903	1907	1912
Cattle	90 385	52 189	171 784
African sheep	182 541	98 069	442 481
Wool sheep	4 201	3 526	46 901
African goats	156 727	99 563	448 279
Angora goats	3 391	3 696	20 431
Horses	5 265	3 119	13 340
Mules	88	4 216	4 879
Asses	899	1 630	7 015
Camels	3	487	789
Pigs	690	1 202	7 195
Persian sheep	—	—	12 588
Karakuls	—	—	4 094
Ostriches	—	—	1 277

The chief factors which determine the rapidity of the development arming in new countries are the market conditions, the attention paid to scientific basis of agriculture in the protectorate, and the conditions of dit. As for the market conditions, which are at present still very unfavour-e, a suitable organization of the trade in and utilization of live stock, ecially of the wool and ostrich feather trades, would be very beneficial. e protectorate should be provided with scientists (veterinary surgeons, teriologists, entomologists, foresters, botanists, chemists, experts in ieral agriculture and specialists for tobacco growing, animal husbandry, it growing and preserving), and the institution of experimental and model ms should be extended and perfected.

The writer anticipates notable advantages from the recent institution in "Agricultural Bank for South-West Africa", with a capital of 10 mil-1 Marks (about £ 500 000) and the right to issue land mortgage bonds ten times this amount. The object of the bank is to satisfy the three ms of credit: credit on the land, credit for improvements and personal dit, the latter by means of institutions such as cooperative associations ady existing or to be founded.

Agriculture in the Belgian Congo. — LEPLAE, E. in *Bulletin Agricole du Congo belge*, Vol. IV, No. 1, pp. 324, 153 figs., 3 plates. Brussels, March 1913.

This Bulletin consists entirely of the report presented to the Colo-l Minister on agriculture in the Belgian Congo and gives a precise ac-nt of the agricultural conditions of the colony.

The writer considers in detail the important question of the colonisation of the equatorial part of the Congo; he enumerates the disadvantages under which agriculture labours and suggests the following reforms:

1) Easier conditions for the purchase and choice of agricultural land, particularly for plantations of less than 750 acres.

2) Ten years' exemption from taxes for agricultural buildings.

3) Suppression of import duties on materials required on plantations and of labour taxes.

4) Abolition of export duties on agricultural products and cheaper rates of transport.

5) A speedy organization of agricultural credit.

4 – **On the Hygienic Organisation of Workers in the Tropics.** — GERRARD, P. 80 pp. Singapore, 1913.

The writer lays special stress on the diseases most prevalent in the tropics, indicating means of avoiding and combating them. As an append the work contains plans of hygienic dwellings for natives.

5 – **Agricultural Instruction for Soldiers.** — HANNE, R. in *Mitteilungen der Deutsch Landwirtschafts-Gesellschaft*, Year XXVIII, Part 47, pp. 636-642. Berlin, Nove ber 22, 1913.

The writer has attempted, by means of questions adressed to 2 teachers engaged in the agricultural instruction of soldiers, to arrive at son practical conclusions regarding the general success of the system which h been in operation in Germany for five years, and to gage the intere aroused in the students by the method of instruction, the time of instructio excursions and inspections, and the use of demonstration material, etc.

6 – **The Agricultural and Veterinary College at Rio de Janeiro, Brazil** (1). *Boletim do Ministerio da Agricultura, Industria e Commercio*, Year 2, No. pp. 107-123. Rio de Janeiro, 1913.

On July 10, 1913, the Agricultural and Veterinary College at Rio J neiro was opened, its foundation having been determined by the Decr of October 20, 1910, dealing with the organisation of agricultural instructio in Brazil. In its first term, the College was attended by 52 agricultural st dents, 8 veterinary students and 5 unattached students. An experime and demonstration farm of about 470 acres is under the management of t College.

7 – **Agricultural Demonstration Train at Rosario de Santa Fé (Argentina).** *Boletim do Ministerio da Agricultura, Industria e Commercio*, Year 2, No. 2, pp. 107 + 4 figs. Rio de Janeiro, 1913.

The writer describes the arrangement of the new agricultural demonstr tion train at Rosario, which has been running since the beginning of 19 in the provinces of Santa Fé and Cordoba in the Argentine, and which co sists of two railway cars, of which one is the lecture room (to accomodate people) and the other is devoted to the scientific material for instructi on plant diseases.

(1) See No. 638, *B.* June 1913. (*Ed.*)

AGRICULTURAL INSTITUTIONS.

The "Société Nationale d'Agriculture de France". — WERY, GEORGES in *La Vie agricole et rurale*, Year 2, No. 51, pp. 645-651. Paris, November 22, 1913.

The writer gives a short summary of the history of the National Agricultural Society of France from its establishment in 1760 by Bertin, De Turly and Bertier de Sauvigny, until the present day. He describes the condition of agriculture in France at the time of the foundation of this society, the circumstances of its establishment, the experiences of the society during the great social changes which have taken place in France, the activity of the Society in the publication of works dealing with scientific agriculture, and in the promotion of agricultural instruction and research. In conclusion a list is given of the eminent scientific and practical men whose names are most closely associated with the history and success of the Society.

AGRICULTURAL SHOWS AND CONGRESSES.

Agricultural Shows.

Brazil.

14. April (opening 21st). Minas Geraes. — Agricultural and live-stock show.

France.

14. Feb. 26 - March 2. Cannes. — Flower show, organized by the "Société d'Horticulture et d'Agriculture de Cannes". Sec.: rue Châteaudun 19, Cannes.

Hungary.

4. May-June. Budapest. — International wine and vine-growing show, organized by the Chamber of Commerce.

Russia.

4. April. St. Petersburg. — International horticultural show.

Spain.

5. Barcelona. — International exhibition of electric industries and applied electricity.

United Kingdom.

14. March 18-19. Belfast, Balmoral. — Show and sale of Aberdeen Angus bulls, cows and calves, organized by the Royal Ulster Agricultural Society.

Uruguay.

the initiative of the Ministry of Industry, the "Asociación Rural del Uruguay" (Montevideo) will organize two exhibition-fairs yearly, on the second Sunday in March and on Aug. 25 respectively. The first will include particularly live stock, crops, market-garden produce, flowers, poultry and connected industries and machines; the second forestry, fruit-growing, poultry, bees and connected industries and machines.

Agricultural Congresses.

Belgium.

4. April. Ghent. — Congress on the bettering of rural conditions, organized by the "Commission nationale pour l'embellissement de la vie rurale". General sec.: M. Verstracten, 15 place van Artevelde, Ghent.

France.

4. Feb. 17-19. Paris. — Annual congress of the "Société nationale d'encouragement à l'agriculture", held during the General Agricultural Show in Paris.

Hungary.

4. May-June. Budapest. — National wine and vine-growing congress, held on the occasion of the International Wine-cellar Exhibition.

United Kingdom.

5. May 22-29. London. — Fourth International Botanical Congress. General sec. of organization committee: Dr. A. B. Rendle, British Museum (Natural History), Cromwell Rd., London S W.

CROPS AND CULTIVATION.

11 – **The Selection of Land for Plantation in the Tropics.** — WOLTMANN: *Jahrbuch der Deutschen Landwirtschafts-Gesellschaft.* Vol. 28, Part 1, pp, 246-262. Berli May 1, 1913.

The writer has often had occasion to observe that the lack of succe of plantations has been due to errors in the selection of the land.

When a farmer intends utilizing virgin soil for a plantation he shou in the first place examine with attention the vegetation on it and the for that it assumes; as the vegetative conditions of a district depend chie upon the climate, it may be said that the susceptibility to cultivation a soil is determined in the first place by *climatic conditions*, and of these t prevailing factors are *temperature* and *rainfall.*

Within the limits set by climate, the soil with its various properties b comes the decisive factor. In the first place there are the *ecological* facto in general and then the *geological* ones.

From the point of view of the latter the origin of the soil has to be i vestigated, that is from what rocks and by what process of decompositi it has been formed; thus there are red soils, yellow soils and laterites wid spread in the tropics. Further the distinction between sedentary a transported soils must be noted. The study of the subsoil is also very i portant, especially from the point of view of moisture conditions.

For the *mechanical analysis* of tropical soils, the writer proposes the f lowing form:

Tropics:
Sample of Soil No. from

I. A depth of 1 metre (3ft. 3 in) in four sections of about 10 inches each, if soil is deep and uniform: each sample should weigh about 12 lbs.

If the soil is not homogeneous, or is in layers, or is superficial, the samples are be taken from the various strata or formations in quantities of 9 to 13 lbs. as limits.

II. Rocks in course of weathering (about 4½ lbs.) } when present.
III. Unweathered rock („ „) }

The samples must be most carefully dried, catalogued and packed, and accompa by the following data:

1. Plantation and situation.
2. Name of field.
3. Name of owner.
4. Geological formation.
5. Dip.
6. If the soil is under pasture, cultivation, steppe, plantation, etc., or virgin fo
7. Depth of arable soil.
8. Depth of loosened soil.
9. At what depth rubble is met with.
10. At what depth the rock is found.
11. Description of the section at every 4 inches in depth up to 1 metre (3ft. 3
12. If water is present in the subsoil and at what depth.

13. Chief crop (coffee, cacao, cotton, tobacco, etc.).
14. Yield of the more important crops in normal years.
15. If manuring is practised, and if so, how often, and at what rate per acre with the various classes of manure.
16. Price or rent of the land.

For the mechanical analyses of the soil the writer finds Benningsen's hod useful. It is to be noted that in the tropics humus has not the ortance that it has in temperate regions, though very important for cer- crops, such as cacao, vanilla, coffee and pepper. The mechanical lysis is also important for irrigation work in the tropics.

In *chemical analysis* the first step is the investigation of lime content, ch is to be done on the spot, using hydrochloric and not acetic aid. Arid s in the tropics are very rich in lime, while moist ones contain very le of this element. Now certain crops require lime: such are coffee, arcane, and among Leguminoseae especially earthnuts; other crops more or less indifferent: thus maize and sorghum thrive in washed-out s containing a minimum of lime.

In general, the writer believes that a tropical soil may be considered d and suitable for a plantation from the point of view of its capital fertilizing substances, when it contains:

Soluble in cold hydrochloric acid:

lime + magnesia	0.2 to 0.5 per cent.
potash	0.1 » »
phosphorus pentoxide	0.1 » »
nitrogen	0.1 » »

The following form is proposed for the chemical analysis of tropical s (see next page):

The determination of the *absorbent power* of the soil is important, ecially in connexion with the prevalence in the tropics of red and yellow s possessing a marked power of absorbing ammoniacal nitrogen and with abundance of nitrogen in the rainfall of the tropics; thus a yearly ıfull of 120 inches brings down about 72 lbs of nitrogen to the acre.

As for *bacteriological properties* the writer has observed the development eguminosae without nodules; nevertheless the practice of inoculation ipreading their cultivation may turn out favourable, especially for soy ns and earthnuts.

Turning to special crops, it may be said that *cacao* requires deep, warm soft soils, rich in nutritive substances, especially potash, and not marshy *fee* requires in the first place a soft soil, moderately moist and rich in nt food, so that it does not thrive on poor sandy soils or on lateritic ones. *tmegs* are very exacting as to soil, which must be of the best, and cli- te, which must have a uniform temperature from 69 to 90° F. and much ıfall. *Vanilla* demands humous soils, moist composts rich in plant food. *al hemp* is suitable for those districts where the conditions of moisture not of the best, being satisfied with 12 to 20 inches of yearly rainfall. *Cot-* grows on all kinds of soils excepting peaty or purely sandy ones;

Designation				
Depth	0-25 cm. (10 inches)	25-50 cm. (10-20 in.)	50-75 cm. (20-30 in.)	75-100 cm. (30-40 in.)
Content in	per cent.	per cent.	per cent.	per cent.
Fine soil (under 2 mm.)				
Moisture				
Loss on ignition				
Nitrogen				
Absorbent power for ammonia				
Substances soluble in cold hydrochloric acid (450 gms. of fine soil for 48 hours with hydrochloric acid of S. G. 1.15)				
iron and alumina . . .				
of which iron				
» alumina . . .				
silica				
lime				
magnesia				
phosphorus pentoxide. .				
potash				
Substances soluble in boiling hydrochloric acid (50 gms. fine soil on water bath with 50 c. c. of hydrochloric acid S. G. 1.15)				
potash				
Class of soil (I to VIII) according to the content in fertilizing matter				
Remarks (nature of the soil, suitable crops, etc.) . . .				

nevertheless, account has to be taken of the subsoil and of the climate, varieties must be selected which can avail themselves of two or t months' rain. *Jute* wants moist alluvial soils. *Rubber* has no sp requirements, save for the fineness of texture, which maintains

isture which seems to favour greatly the formation of latex. *Tan cias* prefer the dry soils of arid regions. *Earthnuts* like deep and soft soils, ver too moist, with sufficient lime and enough water for growth during the st few months. *Palms* behave differently according to their species: thus conuts thrive on all soils except those containing stiff clay either on the rface or in the subsoil; the best are sandy coral soils and basaltic soils, en if rocky, provided they have not undergone weathering to clay; *date lms* must have abundant irrigation; *oil palms* grow on all soils, but prefer ht sandy ones; *sago palms* prefer marshy lands. *Tuber and rhizome crops*, ny species of which form the staple of the natives' food, thrive best on se soft, deep, humous soils free from stones. *Bananas* do not like yey soils, otherwise they grow everywhere, benefiting by organic ma-ring. *Maize* and *sorghum* have no special requirements, while *tobacco* fers soft, warm, deep, humous soils rich in plant food and with suffi-nt potash.

As for the use of manures, the idea that tropical soils are inexhaustible ow exploded; on the contrary it may be said that they get exhausted ily (1). In such cases they are manured or left fallow, or they are aban-ned for new lands. Which of these methods is to be preferred depends upon economic conditions, especially the cost of manuring. It is to be con-ered that manuring has the effect of not only increasing the crops but o ensuring them; and if sometimes, as for instances with tobacco (Ha-na), it may injure the quality of the crop, it may be said that in general keeps the plants healthier. But perhaps the most important effect of nuring is that of prolonging the duration of plantations; thus, for tance, whilst cocount palms live usually about 70 years, the use of nure prolongs their productive existence to 80 and 100 years; for coffee, o, a suitable and early manuring may prolong the life of the plantation 5 or 10 years.

It is to be expected that systematic experimentation, such as the rman Colonial Office and the Colonial Section of the German Agricultural ciety have already undertaken in the German Colonies, will give the same ults as it has given in Germany (2). Greater care is, however, necessary the choice of the manures; thus in the moist tropical regions and espe-lly on ferruginous soils, a deficiency of phosphoric acid is hardly to be red; potash salts mostly give good results in the regions of abundant rains, ilst potash abounds in the arid belts; in general nitrogenous manures not to be recommended in the tropics as they are in the temperate nes; lastly when liming is required it must be done under the form of rl or ground limestone, quicklime being rather too energetic in tropical ls. In a general way it may be said that the colonial farmer must pre-

(1) See No. 1278, *B.* Sept. 1913. (*Ed.*).

(2) See No. 480, *B.* May 1913, and BUSSE, W. (Director of the Imperial German Co-al Bureau). The Organization of Experimental Work in the German Colonies. — *letin of the Imperial Institute*, Vol. XI, No. 3, pp. 462-468. London, July-September 1913 (*Ed.*).

fer the less easily soluble manures to the more soluble ones, especially those regions having a high rainfall which easily leaches the soil : thus sulphate of ammonia and Peruvian guano are to be preferred to nitrate soda ; and bone meal to superphosphate, the soluble phosphoric acid which rapidly retrogrades in red and yellow soils.

12 – **The Soil Solution and the Mineral Constituents of the Soil.** — HALL, A. BRENCHLEY, W. E., and UNDERWOOD, L. M. (Rothamsted Experiment Station) *Philosophical Transactions of the Royal Society of England*, Series B, Vol. 2 pp. 179-200. London, October 21, 1913.

The following investigations were undertaken to examine: 1) the effe of fertilizers on the concentration of the soil solution ; 2) the effect of so tions of different concentrations on the growth of the plant ; 3) the effe of distributing the food solution over solid particles (such as sand, s clay) on its availability to plants growing in such media.

The first question was attacked by treating soil from certain pl of known history with tap water and using the liquid thus obtained water cultures. The moist soil as it came from the field was mixed w tap water in the proportion of 20 kg. of dry soil to 25 litres of water. Af thorough mixing, the soil was allowed to settle, and the supernatant liq was siphoned off, filtered, and run into 600 c. c. bottles, into which seedli were set. The contents of the bottles were renewed at fortnightly interv Each unit of comparison consisted of 10 plants, and to further minim disturbing factors, the experiments were carried out in early spr when the most satisfactory growth is obtained.

The soils were drawn from both the permanent wheat and the perman barley fields, and plots were selected having received the following tre ment :

1). Unmanured, or U.
2). Received nitrogen only annually, or N.
3). » nitrogen and phosphoric acid annually, or N. P.
4). » nitrogen and potash annually, or N. P. K.
5). » complete artificial fertilizer annually, or N. K. P.
6). » dung annually, or D.

As the problem under investigation was not concerned with the n trogen supply, this factor was eliminated by adding sodium nitrate to a solutions at the rate of 0.25 gm. per litre. Both wheat and barley (pur lines) were grown in each solution for a period of 8 weeks, after which th plants were removed, dried and weighed.

The mean results are set out in Table I.

The growth in the solutions from the various soils shows differenc which are parallel to those obtained in the crops on the same plots. Furthe the growth in the solutions is such as would be anticipated from the compo sition of the solutions, large quantities of which were evaporated an analysed with the results set out in Table II (p. 48), where the analys of the soils used and the amounts of the fertilising elements applied in th manure are also given.

TABLE I. — *Mean dry weight of plant in gms.*

Soil	Wheat			Barley		
	Shoot	Root	Total	Shoot	Root	Total
at field, Plot *U.*	0.170	0.135	0.305	0.212	0.105	0.317
» » *N.*	0.157	0.127	0.284	0.171	0.101	0.272
» » *N. P.* . . .	0.598	0.260	0.858	0.660	0.175	0.835
» » *N. K. P.* . .	0.923	0.448	1.371	1.302	0.442	1.744
» » *D.*	1.137	0.425	1.562	1.249	0.377	1.626
ey field, Plot *U.*	0.240	0.169	0.409	0.264	0.138	0.402
» *N. P.*	0.476	0.199	0.675	0.611	0.137	0.747
» *N. K.*	0.208	0.201	0.409	0.275	0.119	0.394
» *N. K. P.* . . .	1.203	0.627	1.830	1.600	0.477	2.077
» *D.*	1.195	0.511	1.706	1.364	0.486	1.850

It will be seen that the composition of the soil solution reflects the nurial history of the plots, and corresponds to that of the soil as judged either the "total" or the "available" plant food it contains.

The following year (1912) the experiments were resumed, and, as the ılts given by the wheat and barley soils had been so similar, they are this occasion confined to solutions made from the barley soils only. order to examine further the conclusion that no other factor entered) the effects produced by the soil solutions than the amount of plant food y contained, comparisons were made between: 1) a culture solution de up in the laboratory to the same concentration in essential nutrients the solutions from the completely manured soils (4.7 parts per million O_5 and 26.7 parts per million K_2O); 2) the soil solutions; 3) the soil ıtions from the partially manured plots, with their essential deficiencies aired by the addition of phosphoric acid or potash or both; 4) a further ificial solution was made up to a much higher concentration, to one in ımon use in the laboratory; lastly, 5), the salts in this artificial solu- n (303.5 parts per million P_2O_5 and 312.4 parts per million K_2O) were led to the soil solutions. As before, in all cases sodium nitrate was led at the rate of 0.25 gm. per litre or 41 parts of nitrogen per million. rley plants were grown for 7 weeks with the results set out in Table III.

From these results, the following conclusions may be drawn. The ificial culture solution of low concentration yielded plants whose weight 763) was distinctly lower, but of the same order as these grown in the soil utions from the completely manured plots (0.963 and 1.465). The artifi-

TABLE II.

Field and Plot	Phosphoric Acid				Potash			
	In soil solution	In soil		Manure annual supply	In soil solution	In soil		Manure annual supply
		Total	Citric acid soluble			Total	Citric acid soluble	
	parts per million	per cent	per cent	lbs. per acre	parts per million	per cent	per cent	lbs. per ac
Wheat, Plot *U*	0.656	0.114	0.0078	0	3.64	0.220	0.0032	
» » *N*	0.881	0.123	0.0074	0	3.55	0.240	0.0032	
» » *N.P*	3.839	0.197	0.0405	60	3.88	0.197	0.0032	
» » *N.K.P*	3.938	0.195	0.0547	60	26.22	0.262	0.0232	1(
» » *D*	4.838	0.215	0.0560	46	29.85	0.285	0.0384	(
Barley, Plot *U*	0.525	0.099	0.0055	0	3.40	0.183	0.0036	
» » *N.P*	3.900	0.173	0.0425	60	3.88	0.248	0.0023	
» » *N.K*	0.808	0.102	0.0081	0	30.33	0.257	0.0407	10
» » *N.K.P*	4.025	0.182	0.0500	60	24.03	0.326	0.0298	10
» » *D*	4.463	0.176	0.0447	46	26.45	0.167	0.0321	6

cial culture solution of high concentration yielded heavier plants (0.943), a proaching those obtained from the completely manured soils, though st below the maximum. The soil solutions from the unmanured plot and t imperfectly manured plot (N. P.) yielded plants of a much lower order magnitude (0.216 and 0.486). The addition of the missing nutrients to t solutions from the imperfectly manured soils produced growth approachi the maximum (1.214 and 1.154); when the nutrients were added set up the higher concentration, the growth produced was equal to th obtained from the artificial culture solution of the same concentration (0.9 and 0.925 against 0.943) though still below the maximum.

These results confirm the conclusion drawn from the previous set experiments: that the growth of plants in the soil solutions is in the ma determined by the amount of plant food the latter contain. One other poi was suggested by the results: that the soil solutions, particularly those fr the dunged plot, were better media for growth than the artificial cultu solutions of equivalent concentration, possibly owing the the presence soluble nitrogen compounds especially valuable to the plant in the earl stages of growth. On the other hand, it is unsafe to lay much stress on su differences in weight as are exhibited in the growth of the plant in the so tions regarded as complete (0.943, 1.214, 0.974, 1.154, 0.925, 0.963, 1.3 1.465, 1.286).

TABLE III.

Nature of solution	Dry weight in grms.		
	Shoot	Root	Total
ficial culture solution, low concentration.	0.514	0.249	0.763
» » » high »	0.652	0.291	0.943
solution, Plot *U*.	0.116	0.100	0.214
» » + added salts, low concentration . . .	0.865	0.349	1.214
» » » » » high » . . .	0.677	0.297	0.974
» Plot *N. P.*.	0.353	0.133	0.486
» » + added salts, low concentration .	0.795	0.359	1.154
» » » » high » .	0.619	0.306	0.925
» Plot *N. K. P.*	0.685	0.278	0.963
» » » + added salts high concetration	0.926	0.423	1.349
» » » Plot *D.*	1.069	0.396	1.465
» » » + added salts high concentration	0.814	0.472	1.286

These conclusions were checked by two further sets of experiments, ere first barley and then peas were grown in the artificial culture ution of low concentration; in soil solutions with their phosphoric d and potash made up to standard by the addition of mineral ts; in soil solutions made up above standard strength; and lastly et was included from which the sodium nitrate was left out. The results these series were in complete accord with those of the preceding series. e addition of nitrogen alone to the soil solutions produced no increase he plant, indicating that the soils themselves had yielded more than ugh nitrate for the needs of the plant, the growth of which had been ited by the amount of phosphoric acid and potash present in the solution. e evidence for the presence in the soil solutions, even in those from the ıged plots, of other substances favourable to growth was slight.

Analyses of drainage waters from the wheat plots during the progress of se experiments showed that, though always more dilute, the drainage ters followed the same sequence as the soil solutions with regard to ir content of phosphoric acid and potash.

The results of these experiments also bear on the question of plant toxins left behind by one crop and having a depressing effect on succeeding crops of the same kind. The wheat and barley in Table I yielded almost exactly the same weight of plant in the solutions from the wheat soils and in the solutions from the barley soils, the latter yielding slightly heavier plants with both cereals. Again, wheat and barley grown in the same solution yield weights agreeing within the range of error of such experiments. These facts alone would indicate the absence in the soil of any soluble toxin injurious to either plant; but the investigation was pushed a step further by comparing the growth in an artificial culture solution, in a set of soil solutions boiled before use, and in another set where the solutions were evaporated, the residues ignited, and then dissolved afresh. The boiling was without effect and igniting the residues generally had a depressing effect on growth. The results were confirmed by similar experiments with lupins, sunflowers and buckwheat and with the peas mentioned above the growth of the other plants corresponded with that of the wheat or barley.

The relation between the growth of the plant and the concentration of the nutritive solution, as distinct from the total amount of the nutrients supplied was also investigated independently of the soil solutions. A standard culture solution was made up containing 0.5 gm. each of potassium di-hydrogen phosphate, magnesium and calcium sulphates, and sodium chloride, 1.5 gm. of potassium nitrate, and 0.04 gm. of ferric chloride, equivalent to N 138, P_2O_5 261, and K_2O 743 parts per million. Barley was grown in bottles containing 600 c.c. of the above solution, at full strength, and diluted to $^1/_5$, $^1/_{10}$ and $^1/_{20}$ respectively, the trials being made in duplicate only. Growth proceeded for 8 weeks with the results set out in Table IV.

From the very outset the growth in the various solutions proceeded in the order of their concentrations, so that the final weights may be taken to represent the rates of growth throughout and not an ultimate condition brought about by the exhaustion of the food supply, though the more dilute solutions were at the finish depleted of the nitrogen they originally contained. To obviate the effects of this depletion a second set of experiments was carried out, in which the solutions were renewed weekly, the other conditions remaining as before. Confirmatory results were obtained. Then a new series was arranged in which the plants were grown in coarse sand contained in vertical glass cylinders through which the nutritive solution slowly percolated. The cylinders contained 800 gms. of coarse sand mixed with 4.25 gms. of calcium hydrogen phosphate (the potassium phosphate was withdrawn from the nutritive solution), and 100 c.c. of the nutritive solution daily was allowed to drip very slowly on the sand, percolate through it, and escape. Growth was continued for two months, with the results set out in Table V.

The solutions escaping from the sand were regularly tested and found to contain nitrate, except in the last weeks of growth with the more dilute solutions.

TABLE IV.

Concentration of solution	Dry weight in gms.		
	Shoot	Root	Total
	1.323	0.332	1.655
	1.605	0.470	2.075
	0.977	0.268	1.245
	1.087	0.405	1.492
	0.742	0.288	1.030
	0.690	0.253	0.943
	0.462	0.219	0.681
	0.369	0.168	0.537

TABLE V.

Concentration of solution	Dry weight in gms.		
	Shoot	Root	Total
	2.969	0.769	3.738
	2.393	0.787	3.180
	1.218	0.304	1.522
	1.698	0.555	2.253
	1.148	0.690	1.838
	0.837	0.221	1.058
	0.488	0.280	0.768
	0.603	0.308	1.011

Two more sets of experiments were carried out in which barley and lupins were employed as test plants and 500 c. c. of solution was dropped though daily. As it was late in the season for satisfactory work, the results were a little erratic, but there could be no doubt of the superiority of plants growing in solutions of higher concentration.

The whole series of experiments confirms the conclusion previously reached that the concentration of the nutritive solution within certain wide limits, irrespective of the total amount of plant food available, is a factor in the rate of plant growth which varies directly, though not proportionally, with the strength of the solution in the particular nutrient or nutrients limiting the growth.

To investigate the third question mentioned above (*viz.* the effect of distributing the food solution over solid particles on its availability to plants), plants were grown simultaneously in water cultures and in sand cultures where 600 c.c. of the food solution was mixed with 3 kg. of fine silver sand (above 0.2 mm. in diam.), these being the proportions required to work the sand up into a fine "crumb" structure. Barley was the trial plant, and the same solutions varying in concentration from 1 to $\frac{1}{20}$ were employed. Every two or three days the jars containing the sand were weighed, and the original water content restored by the addition of pure water. Table VI shows the results obtained.

TABLE VI.

Concentration of solution	Dry weight of plant in gms.	
	Water	Sand
1	1.655	7.050
	2.075	4.200
$\frac{1}{5}$	1.245	3.539
	1.492	3.031
$\frac{1}{10}$	1.030	3.171
	0.943	2.882
$\frac{1}{20}$	0.681	1.556
	0.537	1.437

Far from there being any retardation of growth in the sand due to slowness of diffusion of the nutrients in the water films, the sand culture

ere markedly superior to the water cultures, though as before the rate growth varies with the concentration of the nutrients in the solution. nfirmatory results were obtained when the experiment was repeated and e nutrients (in a concentrated form) were placed inside narrow cylinders porous earthenware themselves filled with sand and packed in the sand which the plant was growing. In this case the roots never came into con-ct with the nutrient solution until it had diffused through the porous cell to the mass of sand beyond.

To extend these experiments to solid media made up of finer particles an the silver sand, a large quantity of a sandy soil was graded into " coarse nd " as before, "fine sand " (0.2-0.04 mm.) and "silt" (0.04—0.01 mm.), ile pure kaolin was taken to represent a clay material. The same solu-n was diffused through all the materials. Barley, and later lupins, re grown in each medium with the following results (Table VII).

TABLE VII.

Nature of medium	Dry weight in gms.					
	Barley			Lupins		
	1.	2.	Mean	1.	2.	Mean
ter.	1.350	1.190	1.270	0.822	1.162	0.942
rse sand	1.456	1.369	1.412	2.486	2.462	2.474
e sand	0.581	0.624	0.602	0.896	1.367	1.131
. . . . .	0.800	0.472	0.636	1.416	1.371	1.393
olin.	1.026	0.719	0.872	1.742	1.925	1.833

Through an accident the barley in the water cultures received twice e volume of the solution diffused through the solid media, but even re the coarse sand preserved its superiority. With the lupins, growth each of the solid media proved superior to that in the water culture, so at the possibility of retardation of growth due to slowness of difusion may dismissed. To explain the superiority of the cultures in sand over the ter cultures, and again the superiority of the cultures in coarse sand and olin over those in fine sand and silt, the writers were led to suspect, by the pearance of the roots, differences in the aeration of the root as a disturb-; factor. Both the coarse sand and the kaolin remained in an open state, ile the fine sand and the silt settled down to a compact mass. To test s hypothesis, the effect of continuous aeration was tried on water cul-es, in the case of both barley and lupins ; an increase of 60 to 80 per cent. s obtained by the aeration. Finally, another set of experiments was ried out in which the water was added to the solid media from below,

so as to obviate as much as possible the settlement of the silt. Settlement still occurred, but the growth was made more nearly equal, though the results are not conclusive as to whether aeration is the only factor concerned, and whether the fines particles in the kaolin and silt are not holding back some of the nutrients from the plants by "adsorption".

The net result of the whole investigation is to restore the earlier theory of the direct nutrition of the plant by fertilizers. The composition of the soil solution, which determines the growth of the plant, is dependent upon the amount and the mode of combination of the phosphoric acid and potash in the soil, both of which are affected by the fertilizer supply, though to what extent is not yet determinable.

13 – **The Influence of Salts Common in Alkali Soils upon the Growth of the Rice Plant.** — MIYAKE, K. (College of Agriculture, Tohoku University, Japan) in *The Journal of Biological Chemistry*, Vol. XVI, No. 2, pp. 235-263. Baltimore, November, 1913.

Rice plants were grown in water cultures of varying concentrations of salts of sodium, potassium, magnesium and calcium, separately and in combination.

The growth of the plants under the different conditions was noted and the following results obtained :

A. — Single salts of the above metals.

1) The salts act as stimulating or toxic agents according to the concentration.

2) The toxic concentrations of magnesium sulphate and chloride, calcium chloride and sodium chloride and carbonate are greater than $\frac{N}{100}$ while those of sodium sulphate and bicarbonate are greater than $\frac{N}{50}$.

3) The concentrations of greatest stimulation were for magnesium sulphate $\frac{N}{500}$ for magnesium chloride and calcium chloride $\frac{N}{1000}$ to $\frac{N}{5000}$, for sodium chloride $\frac{N}{50}$ to $\frac{N}{100}$, for sodium carbonate and bicarbonate $\frac{N}{100}$ to $\frac{N}{500}$.

B. — Two salts in combination.

4) Different cations are mutually antagonistic; the same effect occurs between different anions, but in a less degree. Thus the limit of concentration producing toxic effects is higher in mixtures of salts.

5) The curve for concentration and antagonism between sodium and potassium salts shows two maxima.

6) The antagonism between potassium and magnesium or calcium is almost complete, so that at certain proportions the toxic effect completely disappears.

7) The antagonistic action of calcium cannot be replaced by barium or strontium.

These results have considerable bearing on soil fertility, especially in alkaline soils.

– **Culture Experiments on Sick Soils.** — PERITURIN, TH. T. in *Isviestia Moskovskago Selskokhosiaistvennago Instituta*, Year XIX, Part. 4, pp. 1-137 (138-141), figs. 35. Moscow, 1913 (1).

The writer mentions the opinions of those American workers who hold it soil sickness is due to the presence in the soil of substances injurious plants, which are produced by excretion from the plants themselves or, has lately been believed, by independent formation in the soil. He then alls Istsherekov's experiments, according to which a repeated lixiviain of a sick soil seems to have had a favourable effect on plant developnt, this effect being attributed to the removal of the injurious substances.

Lastly, according to experiments carried out by the writer, who made ee successive cultures of oats in distilled water, this injurious action was t observed (2).

It was different in a series of sand-culture experiments. In glass ssels filled with pure quartz sand and treated with Hellriegels nutritive ution, several kinds of plants were grown in succession (up to three lowing one another) for a six weeks' period. In almost all the experents the plants of the second sowing seemed to be sickly ; the weight of plants when they were gathered, referred to the first crop taken as), is given in the accompanying table.

The unfavourable effect on the second crop in the majority of cases is ident. On adding to the pots 15 grams of pure powdered charcoal after e first crop, the unfavourable effects cease and the plants of the second ltivation develop as well as those of the first. The results may be sumrized as follows :

1. — Through repeated cultures in the same pots the plants assume normal characters owing to which the yield of the second sowing is conerably diminished.

2. — The root residues of the first crop, on decomposing, cause in some y the diminution of the yield of the second crop.

3. — The abnormal development of the second culture cannot be atbuted wholly to the alkalinity of Hellriegel's solution after the first ture.

4. — The abnormal development of the second culture is observed both en the same plant is cultivated in immediate succession or after alterting with plants of other botanical groups.

5. — The addition of charcoal prevents the unfavourable effects on e second culture.

In another series of experiments, cultures were made in glass vessels ed with earth from various localities in Russia. Oats and wheat were

(1) Our article is substantially a translation of the author's summary in German. (*Ed.*).

(2) Some recent experiments, of a preliminary character, seem to confirm in the case as in water-cultures the excretion from the roots of substances poisonous for the plant, both in distilled water and in river water. (MOLLIARD, M. Sur la sécrétion par racines de substances toxiques pour la plante. — *Bulletin de la Société Botanique de ce*, Year LX, Part. 5, pp. 442-446. 1913). (*Ed.*).

Plants first sown	Yield of first sowing	Yield of subsequent sowings										Average of sub-
		Oats	Maize	Millet	Flax	Buckwheat	Camelina	Hemp	Beets	Peas	Poppy	
Oats	100	84.7	—	52.5	—	130.0	—	107.9	138.4	91.4	—	-
Maize	100	—	68.5	—	—	—	—	—	—	—	94.3	81
Millet	100	—	—	21.1	—	—	—	—	—	—	39.1	30
Flax	100	—	38.4	—	44.0	—	31.6	—	51.8	89.3	—	51
Buckwheat	100	98.1	—	—	—	81.2	—	125.6	—	—	82.8	87
Camelina	100	—	—	—	44.9	—	17.8	—	—	—	—	29
Hemp	100	—	—	—	—	—	—	103.1	—	—	—	103
Beets	100	—	86.9	—	—	—	—	—	93.2	—	—	90
Peas	100	—	—	79.2	—	99.0	87.8	—	—	80.4	—	86
Poppy	100	—	—	—	—	—	—	—	—	—	—	-

sown and gathered after six weeks; the ground was then turned over and th superficial part was sifted, after which it was again sown. This second sow ing developed badly, yielding a lighter crop. The application of comple manuring made practically no change in these abnormal results. Sum marizing:

1. — In making two successive cultures in the same pot it was observe that the second yielded a markedly inferior crop and showed abnormal d velopment.

2. — The application of complete manuring had an insignificant actio on this abnormality.

3. — The abnormal development of the second culture is evidently to attributed to injurious substances which have been formed during the fir culture, as the alkalinity observed in the soil cannot be the only cause.

In a last series of experiments the writer cultivated three plants oats or buckwheat suspended on nets in glass vessels of the capacity 2 litres. The vessels were filled with a solution or watery extract of soil o tained by lixiviating 3 kg. (6.6 lbs.) of dry earth with 3 litres of water; in o set of pots the solution was boiled, in another it was filtered through cha coal, and in a third it was used as it was; to every pot Hellriegel's mixtu was added. The solution of most of the soils showed toxic properties cau ing abnormal development and a sickly appearance. The plants develop quite normally in the pots containing the solutions filtered through charcoa they behaved variously in those containing the boiled solution, develop sometimes normally, at other times abnormally. In the solutions of s which had not been previously sown to cereals, the development was norma

Summarizing:

1. — The solutions of sick soils contain substances injurious to plants ıich may be eliminated by filtering through charcoal.

2. — Boiling only eliminates these injurious substances from some soils.

3. — The solutions of soils not previously sown to cereals do not con- in injurious substances.

4. — It does not appear that the soil solutions exert a noxious tion for only one plant, but on vegetative development in general; it no question of specific or toxic action upon certain species or genera.

– Enrichment of Farmyard Manure by Cake Feeding. – HALL, A. D. in *The Journal of the Board of Agriculture*, Vol. XX, No. 8, pp. 665-672. London, Nov. 1913. MANURES AN MANURING.

Whilst a Hertfordshire land similar to that on which the Rothamsted periments are conducted yielded formerly a crop of about 20 bushels wheat per acre under the old four-course rotation, the introduction of w sources of fertility during the last seventy years has raised the produc- on to something over 30 bushels per acre. This extra fertility is usually tained by the English farmer from two sources: 1) artificial manures, e guano and nitrate of soda; or 2) imported feeding stuffs, like linseed, tton cake and maize.

Which source is the cheaper is not a question capable of any general swer, but the English farmer has usually preferred the feeding stuffs, tly because he has imagined that he got a double benefit out of the cake, ., first as food, then as manure, and partly because he has known more out farmyard manure than about artificial fertilizers.

In an exact consideration of the question, it is, however, necessary distinguish the two-fold actions 1) of the feeding stuffs as food and as nure, 2) of farmyard manure as fertiliser and as an ameliorator of the soil cause of the humus it contributes.

It is now generally accepted that at the most one-half of the nitrogen ntained in a feeding stuff reaches the land again in the dung. The point quiring most investigation is the amount and nature of the fertility added cake feeding after allowing for the loss of about 50 per cent. of the ni- gen in the food. With this object in view, experiments were instituted Rothamsted in 1904 on the relative crop-producing powers of equal ights of dung made with and without cake, in the year of their applica- n and in the three subsequent years.

In a field containing eight series, two series of five plots each were ar- nged as follows:

	1	2	3	4	5	
. . . . .	No manure	1904 1908	1905 1909	1906 1910	1907 1911	Ordinary dung
. . . . .	1904 1908	No manure	1905 1909	1906 1910	1907 1911	Cake-fed dung

In each series there is a check plot which remains unmanured; the manure was applied each year to one plot only, the application of manure being renewed at the end of four years and so on. To obtain the dung for comparison, two sets of bullocks were set apart each year, one getting roots and hay only, the other the same plus 4 to 8 lbs. of cake or other concentrated food. The dung made was carted straight out to the land, or was made up into a heap for a month or so, and then well mixed; equal weights were put on the plots at the rate of 16 tons to the acre.

The chemical analyses of the two kinds of dung have given the following average composition:

Manure	Dry Matter	Nitrogen			
		Total	As ammonia	As amides, etc., soluble	Insoluble
From roots and hay only . . .	2.64	0.530	0.043	0.069	0.418
From roots and hay with cake.	2.66	0.701	0.147	0.118	0.436

It will be seen that as regards the insoluble compounds of nitrogen the two kinds of dung are much alike, but the cake-fed dung contains on the average more than double the amount of ammonia and amides.

The rotation adopted was alternating roots and corn: swedes, barley, mangolds, wheat. The results of nine years' experiments compared with the yield of the unmanured plot taken as 100 were the following:

Manure	Yield: total produce (unmanured plot = 100)			
	Year of application	Second year	Third year	Fourth year
	Mean of 9	Mean of 8	Mean of 7	Mean of 6
Dung from roots and hay only	134	123	114	106
Dung from roots and hay with cake	165	132	113	108

The principal conclusion which may be drawn from these experiments is that the extra value conferred upon dung by cake feeding is not of an enduring nature; the first crop gets most of the benefit, giving twice the increase of that getting common dung; in the second crop the ordinary

ıng has given an increase of one-quarter, the cake-fed dung of one-third, hile in the third and fourth years there is no difference.

It is evident that compensation for cake feeding should not be carried ıck for more than two yea:s prior to the end of a tenancy.

These results suggest that on light arable land, where dung is of great portance and where (in England at present) bullock-feeding is unprofitle, the farmer will do better to feed his bullocks without cake, except such is required to finish them off in the last month or so. In this way he ıy save £10 on the cake per acre of root land, while the nitrogen can be ıde up for 20 to 30 s by a dressing of sulphate of ammonia or other nitroıous fertilizers; this method has the additional advantage that the exı nitrogen can be applied to whatever crop will best repay its use, ıtead of being necessarily applied in the dung to the roots.

The writer concludes that other experiments are desirable, experiments ıt involve, as those of the future are all likely to do, systematic account eping as well as a record of yields, because there is a practical issue at ıke which would affect the practice of many of the be t farmers in the ıntry, many of whom, the writer believes, are persisting in a method of taining fertility that once was good, but has now become unprofitable current prices for feeding stuffs and store cattle.

On the Decrease of Available Phosphoric Acid in Mixed Fertilizers containing Acid Phosphate and Calcium Cyanamide. — BRACKETT, R. N. (Chemical Department, Clemson Agricultural College, South Carolina) in *The Journal of Industrial and Engineering Chemistry*, Vol 5, No. 11, pp. 933-935. Easton, Pa., November 1913.

Complaints have been made by manufacturers on the disadvantages sing calcium cyanamide in the preparation of mixed fertilizers, espey in regard to the danger of diminishing the amount of assimilable phosric acid.

Laboratory experiments have shown that when cyanamide is mixed ı superphosphate in the proportion of one part of the former to 6.25, , and even 9.8 parts of the latter, a gradual increase of insoluble phosphoric and consequently a decrease of the assimilable acid takes place; and both in the simple mixture of superphosphate and cyanamide as well ı the presence of organic nitrogenous manures and of salts of potash.

Experiments made on a large scale by three manufacturers have also ıonstrated that a decrease of assimilable phosphoric acid takes place when ıamide and superphosphate are used in the preparation of mixed fer-ers at the rate of one part of the former to 6.25 or 8.33 of the latter.

The same danger of diminishing the assimilability of the phosphoric ı in compound fertilizers, when they contain calcium cyanamide and erphosphate, was confirmed by the analyses made by the fertilizer control ice.

On the whole the experiments show that the factor time has an imtant influence in determining the insolubility of phosphoric acid, and st be taken into consideration, together with the factors represented the increase of temperature which occurs during the mixing and by the alinity of the cyanamide.

In conclusion, it appears from the above that mixing cyanamide wi superphosphate, while not injurious from the farmer's or purchaser's point view, to the resulting compound manure, still requires special attention on t part of the manufacturer and vendor as to the quantity of cyanami used, lest the manure be found on inspection and analysis to be deficie in avaible phosphoric acid.

17 – **The Degree of Fineness of the Lime used for Dressing Land.** — MEYER, in *Illustrierte Landwirtschaftliche Zeitung*, Year 33, No. 84, p. 755. Berlin, Oc ber 18, 1913 (1).

It is now well known that the degree of fineness of the ground limesto used as a dressing has a notable influence on its efficiency. Nevertheless th is no uniform understanding on the subject and consequently the commerc products do not present the same degree of fineness. Thus ten samples ground limestone and two of calcareous mar taken as commercial samp by the Halle a. S. Experiment Station gave the results shown in the acco panying table.

No. of origin	Name	Degree of fineness					
		> 3 mm.	> 2 mm.	> 1 mm.	> 0.5 mm. (sieve No. 5) (*)	> 0.2 mm. (sieve No. 100 for basic slag) (*)	> 0.1 m (fin pul ble
1	Ground limestone	0.80	1.55	9.63	23.38	13.17	51
2	,,	4.12	5.45	17.66	23.12	12.10	37
3	,,	0.00	0.00	0.20	14.76	22.04	63
4	,,	0.00	0.15	17.95	28.63	13.26	40
5	,,	0.00	0.00	7.78	21.24	14.88	56
6	,,	0.00	0.00	0.00	4.05	21.41	74
7	,,	0.00	2.15	9.24	21.79	20.32	46
8	,,	0.00	0.00	0.00	0.32	9.66	90
9	,,	0.00	0.00	0.16	0.43	4.38	95
10	,,	0.00	0.00	1.11	26.52	17.48	54
11	Very soft calcareous marl	0.00	0.27	23.17	26.16	15.80	34
12	Fairly hard d°	0.80	9.30	13.90	22.81	14.24	38

(*) In wire sieves the mesh width is given by the diagonal.

(1) See also *Landw. Wochenschrift für die Provinz Sachsen*, Year 15, No. 43, pp. 355-35 Halle a. S., October 25, 1913. (*Ed.*).

The majority of these limestones have an insufficient degree of fineness, ıd it would be desiderable that the marls should be ground.

The writer accordingly proposes:

1. *a*) The content of fine meal (that passes through sieve No. 100 for ıic slag) of the limestones and of the calcareous marls should be at least per cent.

b) The portion remaining on sieve No. 100, but passing through sieve . 50 should not be higher than 75 per cent. of the amount paid for as e, and the proportion that passes through a sieve with 1 mm. round es must not exceed from 25 to 50 per cent. of the above amount.

c) The portion above 1 mm. should be deducted.

2. It would be desirable that moist calcareous marls and limestones meadows should be dried and if necessary ground before being used.

3. The various forms of lime must bear their proper designation: ıs, for instance, ground limestone must not be sold under the name of carcous marl.

Burnt lime is commonly used in lumps or ground. Lately so-called Körnerkalk" has been put on the market; it is in pieces the size of peas hazelnuts and is very convenient for spreading. The writer, however, ieves that owing to the difficulty with which the pieces break up, it ıdvisable, when burnt lime cannot be applied in any other form, to use ınd limestone instead of "Körnerkalk".

– **Sulphur and Pyrites used as Manure.** — VERMOREL, V. and DANTHONY, E. in *Journal d'Agriculture pratique*, New Series, Vol. 26, No. 47, pp. 651-653. Paris, November 20, 1913.

This article reports new experiments on the possible fertilizing action sulphur, carried out in paraffin-wire pots filled with a soil carefully prived of organic matter.

In one series of experiments nitrogen was given under the form of nite of soda, in the other as dried blood; the nitrogenous fertilizer s mixed with sulphur, and applied to the surface or mixed with the earth; e same was done with the controls without sulphur, all other conditions ıg equal. The results are shown in Table I (next page).

Summarizing: in the nitric nitrogen series the action of sulphur is practlly nil, the differences observed being within the range of experimental ır; on the other hand, in the organic nitrogen series considerable inases of yield have been observed, up to 30 per cent. with wheat and up 10 per cent. with beans (haricots) when the larger quantity of sulphur was ed with the soil. These results appear to confirm those obtained by illanger and Dujardin (1), namely that sulphur exerts little or no ac- 1 without organic nitrogen, but acts energetically in the presence of anic matter.

In the same manner as with sulphur, Vaux pyrites containing 50 per t. of sulphur were also tested, with the results shown in Table II.

(1) See No. 1397, *B.* Oct. 1912 (*Ed.*).

TABLE I.

Treatment	Weight of crop compared to that of contro taken as 100			
	Manured with nitric nitrogen		Manured with organ nitrogen	
	Grain	Straw	Grain	Straw
Wheat				
Control	100	100	100	100
Sulphur as top dressing (of 44.6 lbs. per acre)	98	99	109	112
id. mixed with the soil (*id.* *id.*)	105	104	115	111
id. as top dressing (of 89.2 lbs. per acre)	102	103	121	111
id. mixed with the soil (*id.* *id.*)	104	104	130	162
Beans (haricots)				
Control	100	—	100	—
Sulphur as top dressing (of 44.6 lbs. per acre)	106	—	120	—
id. mixed with the soil (*id* *id.*)	100	—	150	—
id. as top dressing (of 89.2 lbs. per acre)	96	—	130	—
id. mixed with the soil (*id.* *id.*)	98	—	160	—

TABLE II.

Treatment	Weight of crop compared to that of contr taken as 100			
	Manured with nitric nitrogen		Manured with organ nitrogen	
	Grain	Straw	Grain	Straw
Wheat				
Control	100	100	100	100
Pyrites as top dressing (89.2 lbs. per acre)	102	102	129	130
id. mixed with soil (*id.* *id.*)	100	100	120	118
id. as top dressing (178.4 lbs. per acre)	100	101	120	111
id. mixed with soil (*id.* *id.*)	101	100	141	176
Beans (haricots)				
Control	100	—	100	—
Pyrites as top dressing (89.2 lbs per acre)	104	—	142	—
id. mixed with soil (*id.* *id.*)	103	—	140	—
id. as top dressing (178.4 lbs. per acre)	98	—	125	—
id. mixed with soil (*id.* *id.*)	104	—	152	—

As with sulphur, the action of pyrites on nitric nitrogen has been next
) nothing, while with organic nitrogen the increases in yield have been as
igh as 40 per cent. with wheat and 50 per cent. with beans. Thus pyrites
lso has no effect except in the presence of organic matter.

The advantage of using pyrites (1) deserves to be confirmed by experi-
ents on a large scale.

AGRICULTURAL BOTANY. CHEMISTRY AND PHYSIOLOGY OF PLANTS.

- **Research on Vegetable Physiology: II.** — MAZÉ, P. in *Annales de l'Institut Pasteur*, Vol. XXVII, No. 8, pp. 641-681. Paris, August 1913.

In the first part of this paper (2) the writer gave an account of his experi-
ental methods for conducting water cultures under sterile conditions and
ncluded from his work on maize that plants have the power of excre-
ıg residual substances both through their roots and through their leaves
ı the present paper he adopted the same methods of water cultures, and,
ill working with maize, he examined the storage of mineral matter in
ıe various plant organs.

His original food solution was made up as follows:

	gms.
Sodium nitrate	0.6617
Ammonium sulphate	0.514
Potassium phosphate (neutral)	1.0
Magnesium sulphate + 7 Aq	0.2
Ferrous sulphate + 7 Aq.	0.1
Zinc chloride	0.05
Potassium silicate	0.05
Manganese chloride.	0.05
Calcium carbonate	2.0
Tap water	1000

This he calls P×1, and others in which the nitrogen is provided by one
gle compound become P×1 $NaNO_3$, P×1 $(NH_4)_2SO_4$, P×1 NH_4NO_3, etc.

Twenty plants were grown in solutions of various strengths and with
ir nitrogen supplied under different forms; their ash content was esti-
ıted in the various plant organs (Table I). The ash content of the
ves varied little with regard to both the age of the plants and the
ength and composition of the solutions employed, while that of the stems
d roots reflected more markedly differences of age and of food supply.
ıe total ash content of the plants in the solutions in which the nitrogen
ıs provided in the form of sodium nitrate was higher than that of those
which the nitrogen was provided in the form of ammonium sulphate
ammonium nitrate.

(1) See No. 918, *B.* Aug. 1913 (*Ed.*).
(2) See No. 3108, *B* Nov.-Dec. 1911. (*Ed.*).

TABLE I.

No. of plant	Culture solution	Age of plant	Dry weight	Ash per 100 dry matter		
				Stems	Leaves	Roots
		days	gms.			
1	P × ¼	25	2.975	12.31	12.83	—
2		31	4.330	10.75	11.65	14.73
3		45	9.480	7.79	7.90	10.39
4		53	8.560	8.57	8.54	8.70
5	P × ½	25	2.12	16.24	11.11	—
6		31	3.21	17.23	12.62	—
7		45	13.32	17.35	10.12	13.11
8		53	14.38	11.60	11.77	12.38
9	P × 1 $NaNO_3$	25	1.875	20.06	14.40	—
10		31	2.10	18.50	14.66	—
11		45	13.73	20.24	12.00	21.18
12		53	9.39	18.84	12.03	16.10
13	P × 1 NH_4NO_3	25	1.07	15.35	13.95	—
14		31	2.01	13.82	13.46	—
15		45	17.29	22.73	11.83	14.04
16		53	8.07	15.65	12.14	13.75
17	P × 1 $(NH_4)_2SO_4$	—	10.975	18.97	11.76	12.68
18		—	8.630	15.81	11.58	12.92
19	P × ½ $(NH_4)_2SO_4$	—	10.665	13.81	11.64	7.81
20		—	8.26	9.63	11.20	14.53

In a further set of experiments 6 plants, after being developed in a complete food solution, were transferred to incomplete solutions for a certain length of time and then analysed for ash content. Here again there was an attempt to keep the ash content of the leaves constant and approximately the same as in the previous experiment, but this was done at the expense of the stems and roots, which were seriously depleted.

After removal of all plants for analysis, the solutions remaining in the jars were measured and tested for acid or alkaline reaction. The writer discusses the changes undergone by the solutions during the growth of the

ant, and looks upon the results as confirming his previous work on the osmosis of roots.

Absorption of complex organic substances by maize roots. — Nine plants ere raised in various complete food solutions which were later replaced solutions containing complex organic substances. (Table II).

TABLE II.

No. of plant	Complete food solution	Organic solution	Containing organic matter per litre	No. of days in org. solution	Org. matter absorbed by the plant	Dry weight of plant
			gms.		gms.	gms.
1	P × 1 NH_4Cl	Starch paste . . .	4.492	43	7.694	41.34
2	P × 1 NH_4Cl	Peptone Chapoteaut	3.842	43	2.926	33.01
3	P × ½ NH_4Cl	Peptone + NH_4NO_3 0.5 p. 1000 . . .	3.829	43	6.488	48.41
4	P × 1 $(NH_4)_2SO_4$	Humus + $NaNO_3$ 0.5 p. 1000 . . .	0.866	41	2.035	—
5	P × ½ $(NH_4)_2SO_4$	Humus + potassium phosphate 0.5p. 1000	0.682	41	1.626	30.76
6	P × ½ NH_4Cl	Distilled water . .	—	54	—	28.80
7	P × ½ $(NH_4)_2SO_4$	» » . .	—	52	—	26.95
8	P × ½ NH_4Cl	Saccharose	50	25	26.843	40.41
9	P × ½ $(NH_4)_2SO_4$	»	20	25	17.568	31.70

At the end of the experiment the organic matter remaining in the solution was estimated, and from that the amount absorbed by the plant was culated. All plants in the organic solutions produced more dry weight in those in distilled water. Those in the sugar and peptone solutions pre- ted a peculiar appearance : the leaves of the former assumed an upright ition, and the sheaths rolled up as if to avoid the light; on the other nd the leaves of the peptone plants lost their turgescence and elasticity, and ng down along the stems. The roots of these same peptone plants rami- l abundantly, and developed more especially in the air space above the el of the solution in the flask, the extremities dipping into the solution r 3 cm. and following the level down gradually as the solution evapo- ed. The ash content of the 9 plants showed, with two exceptions, the same racteristics as that of the plants in previous experiments : *i. e.* the percen- e in the leaves remained high and fairly constant at the expense of the

roots and stems. The two exceptions were the plants fed on sugar and pep tone discussed above, in which the normal functions of the plant wer evidently interfered with.

The Law of the Minimum and the Law of Physiological Relationship. - Returning to the 2nd set of experiments, it may be remarked that the plants in the incomplete solutions did not make as much growth as the on in distilled water. The writer points out that incomplete solutions mus therefore have a retarding action and suggests as an explanatory hypo thesis his Law of Physiological Relationships, which supposes that for each plant there exists a certain combination of the nutrient elements which give optimum results and that any disturbance of this balance produces ill effect on the plant. To test this hypothesis further a food solution was made u having a strength A, and with it 5 culture solutions were prepared:

1. A $\times \frac{1}{4}$
2. A $\times \frac{1}{4}$ + the potassium phosphate contained in A $\times$ 1.
3. A $\times$ 1
4. A $\times$ 1 » » » A $\times$ 1.5.
5. A $\times$ 1.5.

The resulting plants are shown in a photograph, where 3 is distinctly th largest, followed by 1 and 5, while 2 and 4 are evidently suffering from th effects of some inhibiting factor. The Law of the Minimum, according t which growth is limited by the amount of one particular element which ma happen to be deficient, fails entirely to account for these results, while th Law of Physiological Relationships affords a more satisfactory explanation o facts. The writer continued his researches on the subject, using *Asperg lus niger* and Raulin's solution of various strengths in which the nitroge supply was thrown out of balance and increased to 16 or 32 times the norma amount. In every case the fungus made less growth on the unbalanced so lution than on the balanced solution, whether the latter were weak or strong Similar results, however, were not obtained when potassium phosphate wa added in excess instead of nitrogen.

20 - **The Water Requirement of Plants in the Great Plains.** — BRIGGS, LYMAN and SHANTZ, H. L. — *U. S. Department of Agriculture, Bureau of Plant Industry, Bulle* No. 284, pp. 7-38, plates I-XI. Washington, D. C., October 1913.

This investigation was carried out to determine the differences in wate requirement of the more important crop plants and some of their varieties with a view to determining the most suitable plants for the semi arid conditions of the Great Plains. The water requirement of a plant, o its transpiration ratio, is obtained by dividing the weight of total wate absorbed by the total dry weight of the plant or by the weight of grain. It value varies with changes in the temperature and humidity of the air velocity of wind, intensity of solar radiation and fertility of the soil. I order to control these factors the experiments were carried out in

reened enclosure with a capacity for 200 pots arranged in 5 rows running st and west. The walls of the enclosure to a height of 3ft. consisted of tight oards. A strip of thin cheese cloth 3ft. wide, supported on both sides by ire netting, was placed immediately above the boards. This did not inter- re with the ventilation of the enclosure, but it served to break the force high winds. Measurements with a silver disc pyrheliometer showed that e reduction in the direct radiation of the sun due to this screen amounted to out 26 per cent. at 10-30 a. m. Experiments with tumble weeds (*Amaranthus graecizans*) inside and outside the enclosure showed that the differ- ce in water requirement between the two series was less than the probable ror of observation. Later experiments, however, with more succulent ants like wheat and alfalfa, have shown that the screening effect of ch an enclosure reduces the water requirement in a measurable degree. nce the determination of the *relative* water requirement of the different op plants is the main problem, it was considered necessary to eliminate ch factors.

The pots were made of heavily galvanized corrugated iron, 40 cm. diameter and 66 cm. high, and had a capacity of about 250 lbs. (115 kg.) soil. Each pot was fitted with a heavy galvanised iron cover through ich holes were punched suitable in size and number to accomodate the rticular crop which it was desired to grow. The joint between the can and cover was sealed with a strip of surgeons' adhesive plaster 2 inches wide. re was taken to have the soil at the top of the plots built well up as to be in firm contact with the cover. A special arrangement for supply- ; the necessary water was fitted into the centre of the cover, as it was und that supplying the water at the bottom of the vessel caused stag- tion of the lower portion and increased the value of the transpiration io considerably.

The seeds, after germination, were planted through the openings in the ver of the pot and covered with light moist soil to the level of the cover. The posed soil was then protected from evaporation by means of a layer of x consisting of a mixture of 8 parts of pure beeswax and 2 parts of tallow. e seal was thickened as the plants became established. This method of venting evaporation and excluding rain proved most satisfactory, espe- lly with small grains.

The daily weighings were made upon a spring balance reading to kg. The balance was checked frequently by means of a standard ight kept for the purpose. The plants were cut at the stage when ilar crops were harvested in the field, and the cropping was weighed en and after drying to constant weight at 110° C.

Each pot was weighed soon after the seeds were planted and again imme- tely after the crop was harvested. The weight of water supplied during experiment minus the difference between the final and initial weighings es the total weight of water absorbed by the plant. This method of culation is subject to two errors, which balance each other to some extent, a value too high by the amount of the dry weight of the tops and a lue too low by an amount equal to the green weight of the roots. The

TABLE I. — *Based on dry matter produced.*

Crop	Variety	Water requirement		
		of variety	of species	Relative compared with wheat = 100
Alfalfa (lucerne) .	Grimm	1068±16	1068	211
Pea, field	Canada	800±17	800	158
Artemisia frigida .		765 ± 24	765	151
Rye.	Spring	724±7	724	143
Sweet clover (melilot)		709±9	709	140
Oats	Burt	639±7	614	122
	Swedish Select	615±7		
	Sixty-Day	605±5		
	Canadian	598±14		
Buckwheat. . . .		578±13	578	114
Barley.	Beardless	544±9	539	106
	Beldi	543±2		
	White Hull-less	542±3		
	Hannchen	527±8		
Wheat.	Emmer	534±14	507	100
	Marvel Bluestem	531±5		
	Spring Ghirka	506±3		
	Galgalos	496±4		
	Kubanka	468 ± 8		
Potato	Irish Cobbler	448±11	448	88
Rape		441±12	441	87
Sugar Beet . . .	Kleinwanzleben	377±8	377	74
Corn (maize) . . .	Iowa Silvermine	420±3	369	73
	Northwestern Dent	368±10		
	Esperanza	319±5		
Weeds.	*Amaranthus retroflexus*	356±4	322	63
	Salsola pestifer	336±5		
	Amaranthus graecizans	275±7		
Sorghum.	Dwarf Milo	333 3	306	60
	White Durra	321±2		
	Brown Kaoliang	301±3		
	Red Amber	298±4		
	Blackhull Kafir	278±5		
Millet	Kursk	287±2	275	54
	German	263±15		

TABLE II. — *Based on grain produced.*

Crop	Variety	Water requirement		
		of variety	of species	relative, compared with wheat = 100
a, field	Canada	2218±100	2218	163
e.	Spring	2215±37	2215	163
	Canadian	2204±140		
	Sweedish Select	1632±35	1680	124
ts.	Burt	1500±57		
	Sixty-Day	1383±30		
	Marvel Bluestem	1786±60		
	Spring Ghirka	1382±43		
t.	Galgalos	1245±13	1357	100
	Kubanka	1191±14		
	Emmer	1180±42		
	White Hull-less	1475±40		
	Beardless	1210±38	1244	
y.	Beldi	1155±18		
	Hannchen	1134±27		
wheat. . . .		1037±33	1037	76
t.	Kursk	923±40	923	68
	Dwarf Milo	1123±57		
	White Durra	806±12	790	58
ium, ...	Blackhull Kafir	803±26		
	Brown Kaoliang	726±12		

r requirement of each pot is determined separately and the mean of leterminations is taken to represent the water requirement of the plant r investigation. This procedure also afforded a basis for calculating probable error of the mean determination.

The results of the experiments with various crops are summarised in les I and II.

These results show that field crops differ considerably as regards their iency in the use of water. Alfalfa (lucerne) for example uses four times uch water as millet and sorghum in the production of a pound of dry ter. Corn (maize) ranks next to sorghum and millet in efficiency. The r requirement of the small grain crops is approximately twice that of et, but only half that of alfalfa.

Varieties of the same crop also show measurable differences in their

water requirement, suggesting the possibility of developing strains greater efficiency and more suitable to arid soils than those now grow

The water requirements of the different weeds gave unexpected result *Artemisia frigida* (mountain sage) is a native plant, and, being covered wi a dense silvery pubescence, from a morphological point of view it wou appear to be admirably adapted to a dry country. Its water requiremer however, is 765 ± 24 and as the plant grows very slowly it has a very lo degree of efficiency in the use of water. There would appear to be litt connexion between the morphology, degree of succulence and the wat requirements of a plant.

Determinations of the water requirements of wheat were made und field conditions by means of an extensive series of soil sampling carried o daily throughout the experiments. The rainfall absorbed by the soil w computed from the daily moisture determination. The water requiremen of Kubanka wheat obtained in this were 700 and 862 for the seasons 191 and 1911 respectively, while figures obtained in the pot experiment were onl 468. If, however, we deduct the amount of rainwater absorbed by the so from the above determination, the amount of stored water removed by th wheat in the open field becomes 486 and 466 for the two years, results whic agree with the pot determinations. This shows that wheat is able to mak little direct use of light rains during a dry season when the roots are obtai ing their matter from the lower depths.

Experiments with wheat and sorghum at Akron (Colorado) and a Amarillo and Dalhart in North Texas also gave interesting results. Th evaporation from a free water surface in North Texas during the growin season of wheat was 18 per cent. higher than that at Akron. The wate requirement of sorghum was practically the same in the two region (356 and 359), while the water requirement of wheat averaged 36 pe cent. higher in North Texas. Thus sorghum is relatively better adap ted to Texas and wheat is relatively better adapted to Colorado.

21 – **The Occurrence of Aluminium in Plants.** — KRATZMANN, E. (Pflanzenphysiologischen Institut der K. K. Universität in Wien) in *Sitzungsberichte der K. Akademie der Wissenschaften, math.-naturwiss. Klasse*, Vol. CXXII, Part II, No. 1, pp. 311-336, figs. 6. Vienna, 1913.

The writer first tested the various methods for the micro-chemical determination of aluminium, observing that for the researches on plants the element is to be determined as double sulphate of aluminium and caesium; the sensibility of the reaction is 0.3 μ gm. Following this method, 19 plants belonging to various families were tested for aluminium. The results showed that this element is widely spread in the vegetable kingdom, and that some plants are so rich in aluminium that they may be called "aluminiphilous". Nevertheless the presence of aluminium in plants is not connected with their taxonomic position; there are remarkable differences in the same genus and also individual deviations. In several cryptogams, aluminium concentrates in the fertile tissues, and also among angiosperms it often accumulates in the flowers. Lastly, it appears that plants

sess a specific elective power towards aluminium, for of two plants of erent species grown quite close to each other on the same soil, one may umulate much aluminium and the other none.

- **A Study of the Methods of Estimation of Carbohydrates, especially in Plant Extracts.** — DAVIS, W. A. and DAISH, A. J. (Rothamsted Experimental Station) in *Journal of Agricultural Science*, Vol. V, Part 4, pp. 437-468. Cambridge, October 1913.

During an investigation of the carbohydrates present in the mangold f now in progress, the writers made a special study of the methods of lysis applicable in such cases. They detected certain errors which are ly to occur in this class of work and describe a new method for the esti- tion of maltose in presence of other sugars.

- **Analysis of Willow Ashes.** (Bericht über die Tätigkeit der landw. Kreisver- suchsstation für Mittelfranken in Friesdorf für das Jahr 1912, Year IV). — KLEEMANN in *Landwirtschaftliches Jahrbuch für Bayern*, Year 3, No. 11, pp. 622-628. Munich, 1913.

With the object of determining the basis of a possible manuring for lows, complete analyses of the ash of various parts of two kinds of willow e made, besides determinations of the nitrogen content. These data were herto lacking in the literature on the subject.

Percentage fo dry matter.

	Part	Nitrogen	Ash	Silica	Phosph. pentoxide	Chlorine	Sulphuric anhydride	Carbon dioxide	Ferric oxide and alumina	Lime	Magnesia	Potash	Soda
Salix viminalis ered in the middle September)	Leaves	2.59	7.93	0.71	0.12	0.13	0.82	1.22	0.08	2.41	0.97	1.22	0.13
	Bark	1.31	3.61	0.05	0.04	0.01	0.18	0.82	0.04	1.24	0.34	0.87	—
	Wood	0.42	1.04	0.04	0.06	0.01	0.04	0.21	0.02	0.29	0.14	0.37	—
Salix amygdalina ered in the middle September)	Leaves	2.73	6.08	0.40	0.06	0.12	1.02	0.07	0.07	1.04	0.74	1.72	0.05
	Bark	1.37	3.38	0.05	0.03	0.01	0.15	0.02	0.02	0.93	0.33	0.94	—
	Wood	0.39	1.07	0.03	0.04	0.01	0.05	0.02	0.02	0.20	0.10	0.36	—

- **The Stomatal Characteristics of Sugar Cane.** — DUNLOP, W. R. in *West Indian Bulletin of the Imperial Department of Agriculture for the West Indies*, Vol. XIII, No. 4, pp. 314-323, + plates I-II. Barbados, September 1913.

A large number of different varieties of sugar cane were examined unde l conditions with regard to those characters of the leaves affecting the e of transpiration, *viz.* manner of curling, motor cells and woody tis- frequency and size of stomata, etc.

The following conclusions were arrived at :

a) The morphological and anatomical characteristics of the leaves of h variety are so definite as to provide a ready means of identification.

b) Stomatal density per unit area is one of the chief characteristics, but s not appear to be correlated with other leaf characters such as size

of leaf, size of individual stomata, and total area of foliage, though su stomata are often numerous and *vice versa*.

c) There appears to be some correlation between susceptibil to drought and the ratio of the total stomatal area to the total area foliage, but this point requires further investigation.

d) The manner of curling is probably more important in limiting effective action of the stomata than the stomata themselves. It is con ated with the ratio between the stomatal densities of the two leaf surfa with the anatomical structure (motor cells and woody tissue) and with erect position of the leaf. This correlation between leaf habit and stoma charateristics appears to affect the distribution of varieties in cultivati

e) The greatest stomatal area was associated with a very high su content.

The writer suggests that more attention should be paid to the ha and stomatal characteristics of the leaf in selection for drought resista in sugar cane.

25 – On the Importance of the Structure of the Ear in the Selection of Maize. FLEISCHMANN, REZSÓ in *Kösteiek*, Year 23, No. 89, pp. 3012-3013. Budapest, Nov ber 15, 1913.

In selecting the ears of maize, growers as a rule only take into cons eration the pure line and the percentage of cob and grain in relation to t whole ear. There are, however, certain other essential characters whi should not be lost sight of. One is the number of rows, which may va from 8 to 26 or even more in the case of the Horsetooth variety.

The importance of this character is demonstrated by observation specimens of the above-mentioned variety, selected on the Ruma (1) estat these showed that the weight of grain per ear increases regularly with t increase in the number of rows from 8 to 22.

The result of selection in increasing the number of rows in the co is shown in Table I.

TABLE I.

Year	Parents	Number of rows of grain in offspring										Average number of rows of grain in the ear
		8	10	12	14	16	18	20	22	24	26	
1909	Original plants selected in the field	0.7	5.2	39.8	41.2	10.8	2.0	0.3	—	—	—	13.0
1910	Line No 127 (16 rows) . .	—	—	7.8	29.0	38.2	17.2	5.5	—	—	1.5	0.8	15.9
1911	127/1910 (16 rows).	—	—	6.0	47.8	29.8	11.9	4.5	—	—	—	—	15.2
1912	127/1911 (18 rows).	—	—	7.2	17.9	34.6	32.2	5.9	2.3	—	—	—	16.4

(1) See No. 928, *B.* Aug. 1913. (*Ed.*).

The result was that the ears of 1912 had an average of 3 or 4 rows ore than the original material of the first year.

In the number of seed-rows of the ears selected on the Ruma estate, the erage of the ancestors varies about the figure 14, and the experimental ta relating to the 1912 harvest indicated in Table II show that the off-ring revert to this mean.

TABLE II.

No. of lines	No. of rows of grain in parents	Average No. of rows of grain in the ear of each generation
Plot No. I:		
13	14	14.04
20	16	14.58
5	18	15.56
2	20	16.23
1	22	17.31
Plot No. II:		
1	12	13.40
9	14	14.21
34	16	14.78
4	18	15.29
1	22	15.94
1	26	17.25
Plot No. III:		
7	12	13.92
24	16	15.01
6	18	15.32
8	20	15.88

According to these data the average number of rows of seeds in the ispring of the many-rowed parent ear is greater than the average of those om the fewer-rowed parent ears, but the average of the first approaches ore nearly the average number of rows of the whole group (*i. e.* 14) than the mber of rows in the parent ear. This character can only be fixed by pro-nged and continued selection.

The results obtained in the pedigree selection on the Ruma estate during ve years show that there is in the majority of cases a correlation between oductivity and the number of seed-rows, as shown in Table III, in which le original plants of 1912 are divided into three groups according to the mber of rows of their descendants of the first generation.

TABLE III.

Plot	No. of rows of parents		
	14	14-15	more than 15
	kg.	kg.	kg.
I (43 ears)	8.16	8.50	8.85
II (34 ears)	6.15	6.33	6.48
III (40 ears)	6.89	7.50	7.10

The ears of the high-cropping types had, except in certain cases, the greatest number of seed-rows.

The number of seed rows in the ear is also correlated with other characters. With increase in the number of rows the tips of the seeds are narrowed and become elongated, while the percentage of rachis in the ear decreases. The following results were obtained by the writer:

No. of rows	8	10	12	14	16	18	20
Percentage of rachis in the ear	20.6	16.7	14.4	14.3	15.4	15.3	14.9

These observations show that in the selection of maize or the improvement of the yield considerable importance should be attached to the number of seed-rows. At the same time the other characters must not be lost sight of. Further, the quantity and quality of the seeds, and the structure of the seeds, and the structure of the rachis are also important factors in the analysis, a thickened rachis being correlated with a low yield. Also a thick rachis contains more pith, which takes longer to dry and deteriorates quicker, especially during a wet season. The heredity of this character is shown in the following table:

Percentage weight of rachis in selected types at Ruma.

Type No.	181	288	127	204
1909 - Parent ears	8.9	11.0	15.9	17.1
1910 - 1st generation	11.7	10.4	14.4	15.3
1911 - 2nd "	13.2	13.3	14.7	16.3

26 – ***Tacca umbrarum*, a Starch-producing Plant in Madagascar.** — FAUCHÈRE, A. in *Journal d'Agriculture tropicale*, Year 13, No. 148, pp. 316-317. Paris, October 1913.

Tacca umbrarum ("Tavolo") grows wild on the eastern slope and in the interior of Madagascar. It produces tubers the size of a fist and sometimes

n as large an ostrich's egg. The natives of some provinces use them as d, either cooked whole or as flour extracted by primitive methods.

The plant grows in soil of varying fertility. The fresh tubers yield ut 30 per cent. of dry marketable flour. This plant will probably soon be tivated and may become an important source of starch.

The Oil Palm. — *Bulletin de l'Association des Planteurs de Caoutchouc*, Vol. V, No. 10, pp. 256-257. Antwerp, October 1913. OIL CROPS.

The oil-palm (*Elaeis Guineensis*) is the source of palmetto-oil and palm-

The former is used in the preparation of vegetable butter, for which re is an ever increasing demand. The latter is in request by soap-manufacturers, being the most suitable fat for their purpose. The price of palm-nels, which 20 years ago was 8s to 10s per cwt., has now reached 24s 26s.

The introduction of this African palm into Asia has given very encouring results. Its growth is satisfactory and the yield and richness of the it are superior to those in Africa. Experiments show that one acre of se palm trees yields more than 2500 lbs. of palm-oil, producing a profit £ 24 per acre. The cost of establishing and maintaining till bearing ins reaches £ 32 per acre. These trees come into bearing in four years.

In the province of Tamiang in Sumatra, preparation has been made for nting 7 500 acres per year.

Gru-Gru Palm Kernels (*Acrocomia sclerocarpa*) in Trinidad. — *Department of Agriculture, Trinidad and Tobago, Bulletin*, Vol. XII, No. 74, pp. 137-138. October 1913.

The gru-gru nut is widely distributed throughout Trinidad, but not sufficient abundance for the development of an export trade. It is used lly as a roasted nut. Analyses at the Imperial Institute gave the follow-results.

Kernels	per cent.
Moisture	6.1
Fat (yellowish white, crystalline)	57.0

Analysis of fat compared with palm-kernel oil.

	Gru-gru fat	Palm-kernel oil
Specific gravity	0.867	0.8731
Acid value (1)	1.3	—
Saponification value (2)	253.7	242.4 to 254.8
Iodine value, %	16.2	10.3 to 17.5
Hehner value	88.5	91.1
Insoluble fatty acids, %	88.1	—
Unsaponifiable matter, %	0.41	—
Volatile fatty acids, soluble (3)	5.7	5.0 to 6.8
» » insoluble	12.6	—

(1) Milligrams of potash per gm. of oil.
(2) Cubic centimetres of N/10 alkali required to neutralise acid from 5 gms. of oil.
(3) Reichert-Meissl-Wollny number.

These gru-gru kernels should realise about the same market price oil-palm kernels (£23 per ton), and should find a ready market if offered shipments of from 50 to 100 tons.

29 - **The Rubber Crisis.** — 1. TILMANT, J. in *Bulletin de l'Association des Planteurs de Caoutchouc*, Vol. V, No. 10, pp. 247-256. Antwerp, October 1913. — 2. ZIMMERMANN in *Deutsche Tagesseitung*, No. 572, 2nd. Supplement. Berlin, November 10, 1913.

M. Tilmant summarises various views brought forward by journals reviews and other authorities on the present rubber crisis and its possible solutions. Protection is of particular importance in its relation to wild rubber.

Brazil. — A reduction in price does not affect the production till the following year. The quantity harvested depends on the credit of the "aviadores" and the means which they possess of sending workmen into the forest. They have suffered considerably this year owing to the fall in prices, and it seems doubtful if they will be in a position to finance the usual number of workmen next year.

The following measures have been adopted for improving the situation: Reduction of export duties by half; suppression of all duties and taxes on plantation rubber; construction of railroad; to reduce cost of trasport; construction of refining stations, so that only first quality products are exported.

Belgian Congo. — The export duty of 1.75 francs per kilo (7½*d* per lb.) has been removed. It is hoped that recourse to bounties will be avoided by the following means: Reduction of freight charges by rail and steamer; more careful collection of the tax, which is at present too frequently evaded; increasing the tax on underselling pedlars.

French Equatorial Africa. — Export duties have been lowered from one franc to 0.30 franc per kilo (2¼*d* to 1½*d* per lb.). Including the reduction on the cost of transport by the Belgian Congo railway and the steamship companies, the total reduction on rubber in the French possessions amounts to 0.70 franc per kilo (3 *d* per lb.).

German Colonies. — In *East Africa* the most important question is the organisation of labour. The period of indenture should be increased from one to three years, in order to reduce the loss of time and money to the coolies, the owners and the colony. According to Dr. Zimmermann, the cost of production can be lowered by increasing the output of the workers and the purity of the product. An expert coolie should easily harvest a quantity of latex equivalent to 900 grammes of washed rubber; at a market price of 3.5 marks (1*s* 6*d* per lb.) this will give a profit of £30 per ton. The reduction granted by the steamship companies has lowered the freight from 90 marks (£4 10*s*) to 65 marks (£3 5*s*) per ton. The reductions by the railway companies amount to 50 per cent. Unfortunately the total reduction represents only about ½*d* per lb. *Kamerun* asks for the abolition of the export duty of 1 ¾*d* per lb.

- **A New Method of Tapping Manihot.** — *Der Pflanzer*, Year 9, No. 9, pp. 473-475. Daressalam, September 1913.

M. Migdalsky, director of the Prinz Heino Plantation, Morogoro, E. ica, has discovered a method of diminishing the expense of tapping Mani- trees. Lewa's method of rolling into balls involves considerable hand- our, and has been modified as follows: a piece of cloth about 28 inches g and 4 inches broad is soaked with a solution of vinegar and applied the incision in the bark; the cloth is then drawn upwards in close con- t with the tree. The latex adheres to the cloth and is coagulated in form of a small pellicle, which is easily detached:

This method has distinct advantages.

1) Fewer incisions are required compared with the older method and trees can be tapped more frequently.

2) The rubber is pure and can be cleaned by hand, one workman being le to clean 60 lbs. per day.

3) The operator does not require the same skill as with the older me- od.

4) The yield of the labour is considerably increased. Unskilled workmen ve produced in one day the following quantities:

a) by the old method (in balls). . . . . 8 1/2 oz.

b) by the new method . . . . . 28 oz.

- **Tobacco in the French Colonies.** — PRUDHOMME, EM., in *L'Agronomie Coloniale*, Year 1, Nos. 1-4, pp. 1-7, 42-52, 68-75 and 104-111, + 3 maps and 2 plates. Paris, July-October, 1913. VARIOUS CROI

In 1910 a "Permanent and Interministerial (Finances and Colonies) mmission on Colonial Tobaccos" was appointed to investigate methods of proving the cultivation of tobacco in the French colonies and to inform nters of the best methods available. This Commission came to the fol- ing decisions:

1) To undertake a detailed study of the different varieties of tobacco tually grown in the colonies.

2) To enable planters to obtain good seed and technical advice, and to rchase their produce on trial through the Ministry of Finance.

3) To train a qualified staff, by organizing at the Ecole Nationale Supé- ure d'Agriculture Coloniale a complete scheme of instruction, theoretical d practical, on the cultivation and preparation of tobacco.

Present State of the production of tobacco in the colonies, according to the ort of the Commission.

Dahomey. — This tobacco is characterised by perfect combustibility, e texture and low nicotine content, generally less than 1 per cent. These alities make it probable that Dahomey can produce large leaf tobacco. r native consumption the coarser American varieties might be tried, such Black Virginia and Kentucky, as preferred by them.

Guinea. — In this colony the tobacco is consumed particularly as snuff d chewing twist. In Camayenne crops of tobacco of good quality have en produced suitable for the manufacture of French pipe tobaco. Yel-

low Orinoco Virginia has shown itself superior in its mildness and g combustibility.

Senegal. — The production in this colony is not sufficient for lo consumption and large quantities are imported from America.

Equatorial Africa. — Tobacco is cultivated chiefly in the immedi neighbourhood of the villages of the Oubangui-Chari-Tchad and the Mid Congo ; in the latter district it gives rise to a considerable trade. Ow to its defective market condition, the French Administration will not cept it, although its combustibility is recognised as very satisfactory a its nicotine content is low, not exceeding 1.8 per cent.

Réunion. — This island already exports tobacco, but not to Fran There is a commercial movement of considerable importance which produc about £ 16 000. The chief variety cultivated is Langue de Boeuf, whi has stiff lanceolate leaves with fine veins and resistant tissue. It is grow chiefly as an intercrop with sugar-cane in alternate lines with about 3 3 plants per acre. In order to reduce the strength of the tobacco and increa the fineness of the leaf for European consumption, it seems desirable adopt a closer system of planting.

The preparation in Réunion comprises the following processes: 1) desi cation, 2) picking and sorting, 3) rolling, 4) pressing 5) cutting. Pickin consists in removing the midribs of the leaves. Rolling includes sorti into bundles of about 26 lbs. The rolls are then submitted to a stron pressure and tightly bound. The tobacco thus undergoes fermentation small heaps.

Cultivation experiments carried out at the St Denis Botanic Garden (Réunion) have shown that it is possible to obtain: 1) tobaccos (variet Szamoshat) possessing such fineness of texture and colour as to resemble well-known leaf tobaccos ; 2) cut tobaccos (especially Maryland) of averag strength and without a characteristic taste ; unfortunately these tobacco (except Maryland) smoke so badly as to be almost unusable.

The Commission considers that investigations should be carried out t improvements in combuibility.

32 – **Turkish Tobacco in the Cape Province.** — STELLA, L. M. in *The Agricultu Journal of the Union of South Africa*, Vol. VI, No. 4, pp. 617-636 + plates L-LXI Pretoria, October 1913.

Since 1906 the government has conducted experiments on the cul vation of Turkish tobacco in the Cape Province. These experiments ha been carried out on private farms in charge of an officer. The progress the cultivation during the last seven years is shown in the following tabl

The low price of the last year's crop is attributed to the unmatured sta of the tobacco, which, not being in a suitable form for storing, had to be sol rapidly to unwilling buyers. The local demand for this tobacco is estim ted at about half a million pounds per annum, so that with improved metho of preparation and marketing, this industry has considerable possibilitie of further development. With this object in view the " Western Tobac Growers' Company, Ltd. " was formed in July 1912, and a scheme of rule

Year	No. of farms on which experiments were carried out	Area	Yield	Average price per lb.
		acres	lbs.	*s d*
6-1907	6	7 ½	3 000	1 6
7-1908	12	25	13 000	1 11
8-1909	14	70	16 000	2 0
9-1910	18	113	56 000	2 1
0-1911	24	250	140 000	2 1 ½
1-1912	32	400	250 000	1 6 ½
2-1913	42	525	—	—

l regulations were drafted. A warehouse has since been opened and solution of the profitable marketing of Turkish tobacco appears to in sight.

- The Cultivation of the Rose Geranium and its Present and Future Economic Conditions. – CHARABOT, EUG. and GATIN, C. L. in *Journal d'Agriculture Tropicale*, Year 13, No. 148, pp. 289-295. Paris, October 1913.

The writers wish to suggest the cultivation of the rose geranium (*Pelargonium odoratissimum*) to planters. They emphasise the effect of climatic l soil conditions on the quantity and quality of the essence. Small trials uld be made at first and the cultivation only continued in those places ere it gives perfect results.

- Note on a Lemon-Grass from Fiji. — KNOWLES, C. H. *Department of Agriculture, Fiji, Bulletin* No. 6, pp. 4. Suva, 1913.

The writer gives the results obtained at the Nasinu Experiment Station h a lemon-grass (*Cymbopogon coloratus* Stapf.), introduced in 1907 from ia. The most favourable time for harvest is when the plant has ched 3 or 4 feet in height before the flowering period is advanced. The centage of oil in the young plants is greater than that of the old ones, but total yield obtained is less. Thus a plot cut four times produced only -third of the quantity of oil obtained during the same time from a similar t cut only once after reaching 4 feet in height. The estimated yield il is 43 lbs. per acre per cutting.

Distillation experiments show that the process should not continue ger than 4 hours, because the amount of essence produced after this e is unprofitable. The profits per acre should reach £2 per cutting, l two or three harvests are obtainable in the year.

35 - **A Perfume Plant from West Africa: *Popowia Capea.*** — *Bulletin scientifique et industriel de la maison Roure-Bertrand Fils de Grasse*, 3rd Series, No. 1, pp. 3-17 + 4 plates. Grasse, October 1913.

Popowia Capea, or "capé", is a shrub belonging to the Annonaceæ. The natives of the Ivory Coast crush it into cold water to perfume their baths. The dried stems and leaves are sold at about 1 franc the kilo (4 ½ *d* per lb.). M. and Mlle. Camus have made a complete botanical study of the species which is given in the Roure-Bertrand bulletin (1).

The dried leaves give 59 per cent. of oil; of this, 35 per cent. is heavier than water, and the rest lighter; the first part may be called the heavy portion and the second the light portion. The accompanying table gives the analysis.

	Complete Essence	Heavy portion	Light portion
Specific gravity at 20°	1.00416	1.00808	0.99596
Polarimetric deviation	+ 76° 56'	+ 90° 54'	+ 51° 26'
Solubility in 80 % alcohol	1 vol. then cloudy	1 vol. then very cloudy	1 vol. then very cloudy
Solubility in 95 % alcohol	0.5 vol., then very slightly opalescent.	1 vol., from 3 vols. marked opalescence	0.5 vol., then very slightly opalescent
Index of acidity . . .	2.8	1.5	3.7
Saponification value .	166.1	192.3	123.2
Saponification value of acetylated essence .	239.9	248.3	218.4

This essence is thus especially distinguished by its high density, its high dextro-rotary power and the high proportion of saponifiable matter.

36 - **On the Anatomy of the Seed of *Abrus precatorius* ("Jequirity") and of the Seeds Used to Adulterate it.** — BARIOLA, ROSA in *Atti dell'Istituto Botanico dell'Università di Pavia*, 2nd Series, Vol. XVI, pp. 16, plates I-V. Pavia, 1913.

The writer, following up the preliminary note published at the end of 1912 (2), discusses at length the morphology and anatomy of the seed of *Abrus precatorius* ("Jequirity") and of the seeds of other Leguminosæ (*Rhynchosia precatoria* = *R. phaseoloides* DC., *Adenanthera pavonina* L. and *Ormosia dasycarpa* Jacks.) used in the adulteration of "Jequirity".

(1) See also N. 214, *B.* Jan. 1912. (*Ed.*).
(2) See. No. 262, *B.* March 1913. (*Ed.*).

- The Forcing of Spanish Iris. — *The Gardener's Chronicle*, Vol. LIV, No. 1404, pp. 357-358. London, November 22, 1913. MARKET GARDENIN

Spanish Irises (*Iris Xyphium*) cannot be forced like most bulbs, but n only be induced to flower a few weeks earlier. Boxes 12 to 15 inches uare and 3 to 4 inches deep are most suitable for the purpose. No leaf ould or manure is required, but the top layer of a well-manured and limed l is required and it should be sterilised by steam or chemicals before e. The bulbs are pressed into the soil until they are ½ inch below the ge of the box, and covered to a depth of 3 or 4 inches with ashes. The mperature of the house should be maintained equable at about 45° F.

Experiments with several varieties gave the following results:

Variety	Cold House		Warm House		
	First bloom ready	Remarks	Date of housing	First bloom ready	Remark
e Chinoise . . .	June 23	Intense yellow Good growth	Jan. 19	Apr. 20	Fair
iche Fleur. . . .	May 29	Good growth	Jan. 19	Apr. 22	Good
is	May 27	Good Pale blue	March 20	May 10	Good
von Humboldt.	—	—	Jan. 19	May 10	Bad
h Queen. . . .	May 24	Good Pure white	March 20	May 10	Good
of Nassau . .	May 28	Good. Blue	Feb. 26	May 26	Good

A box of each of the above varieties was kept at a temperature of 60° ° F. The buds came up plump and healthy and then withered in spite nple supplies of water; this suggests that these bulbs have not suffi- latent vitality to develop under hard forcing.

Forest Protection in Canada. — Forest Protection in the Dominion. — *Communicated by* T. K. DOHERTY, *Commissioner for the International Institute of Agriculture in anada.* FORESTRY

Roughly speaking, Canada has a forest area of 781 000 square miles. But ite of the fact that the country possesses such great areas of timber- it has been recognised within recent years that the supply was being lly depleted. This depletion was due not so much to the legitimate ation of timber as to the enormous waste caused by forest fires and icient lumbering methods. As a result of this, the governments of the ral provinces, as well as the Federal government, wisely undertook to a stop to these losses. At the present time all of the provinces which ess forests have some form of legislation looking to the protection eir timberlands from fire.

In order to show the progress that has been made, as well as wh may yet be attempted, the Commission of Conservation has, through i forester, Mr. Clyde Leavitt, just completed a report on forest protection i Canada. The report gives a resumé of what has been accomplished throug the operation of the well known order No. 16570 of the Board of Railwa Commissioners, respecting the prevention of forest fires along railwa lines. It further points out the splendid progress that has been made b British Columbia in holding the number of forest fires in that province t a minimum and explains the working of existing legislation on the prairi in Ontario, Quebec and the Maritime Provinces.

A special feature of the report is the discussion of the brush dispos problem in lumbering operations. In this regard the experience of the Unite States in preventing fires in national forests, as well as the work that i being done by the Western Forestry and Conservation Association is full explained. The working of the topping law as applied to the forests in th Adirondacks is also covered fully. The use of oil fuel by railways in region subject to forest fires is given considerable attention, and the opinion of the officials of railways using oil are quoted copiously. A section of th report is also given over to a discussion of forest planting in Canada.

The report as a whole should prove to be a valuable source of informa tion to those who are interested in conserving Canada's forests.

39 – **The Palmyra and Dum Palms in West Africa.** — DE GIRONCOURT, G *Annales de la Science agronomique*, Year 30, No. 4, pp. 408-419. Paris, October 1

The wood of the Palmyra palm (*Borassus flabelliformis*) is very v able for building on account of its large dimensions and rigidity. Its popula leads to unfortunate results, for its utilization for European buildings ta precedence over the numerous uses of the leaves and fruits, so that th is danger of its extinction in the parts of the Sudan bordering on the Sahel zone (upper Senegal and Niger).

The natives make use of the pericarp only; the kernels, which constit one-third of the weight, may be used as a substitute for coroso, and a p of £16 per ton has been offered for them at Hamburg.

Certain precautions must be observed before a marketable product can be obtained. The nuts should be gathered soon after their fall prevent germination, and the kernels must be thoroughly dried bef opening, to prevent mould. At present two concessions have already b sought in West Africa.

The writer also deplores the disappearance of the dum palm (*H phœne thebaica* var. *oethiopica*) (1) from the Upper Niger region, owing its careless exploitation for use with steam engines. An example fr south of Timbuctoo shows remarkable results from careful reservation this tree. The Governor of Togo, Count Zech, has proved without dou the possibility of checking this careless exploitation by inculcating a bet appreciation of this tree amongst the natives, thereby encouraging planting and promoting the development of the colony.

(1) See No. 2714, *B.* Aug.-Sept.-Oct. 1911. (*Ed.*)

LIVE STOCK AND BREEDING.

HYGIENE.

- Malignant Oedema in Sheep. — EHRLICH in *Landwirtschaftliche Wochenschrift für die Provinz Sachsen*, Year 15, No. 47, pp. 387-388. Halle a. S., November 22, 1913.

The writer gives a short description of Koch's oedema bacillus, the cause the above disease, which occurs in Germany under the forms of a purulent lammation of the vagina and uterus, an inflammation due to injuries ring shearing, and as an inflammation resulting from dog bites or infec- n during castration. The following preventive measures and remedies : recommended.

1. Affection of vagina and uterus: segregation of lambing and sick es, which should be kept scrupulously clean; the injection of oxydizing infectants into the diseased parts.

2. Inflammation of shear-wounds: disinfection of the wounds with benzine d a solution of pyoktaniniodine tincture (to be prescribed by the veter- y) immediately after shearing.

3. Inflammation from other wounds: thorough disinfection of the nds after castration.

ANATOMY AN PHYSIOLOGY.

Studies of the Endogenous Metabolism of the Pig as Modified by Various Factors. — MC. COLLUM, E. V. and HOAGLAND, D. R. (Laboratory of Agricultura Chemistry, University of Wisconsin) in *The Journal of Biological Chemistry*, Vol. XVI, No. 2, pp. 299-326. Baltimore, November 1913.

Pigs were fed on a nitrogen-free diet of carbohydrates, salts, and water. urine was collected daily, and the amount of nitrogen present under form of creatinine, creatine, ammonia, and urea, as well as the total ogen, was estimated.

On a diet of starch and alkaline salts the total nitrogen output attained inimum value; the creatine content was constant and approximately al to 18.5 per cent. of the total. When the alkaline salts were replaced neutral salts the total nitrogen rose immediately owing to an in- sed output of ammonia, while the urea and creatinine remained approxi- ely constant; the same effect was obtained by feeding hydrochloric acid.

The substitution, wholly or partially, of starch by fat in the diet had effect on the total nitrogen output, while the total creatine (creatinine reatine) was in one case increased and in another decreased, possibly ng to the fact that one animal was receiving neutral salts, while the r received basic salts. Finally, the addition of up to 16 gms. daily of oic acid to the diet had no permanent effect on the output of total ogen, ammonia or creatinine, but the urea was decreased and the ters are of opinion that the nitrogen lost in this form is converted into puric acid.

42 - **New Method for Calculating the Value of Foods from the Point of Vi of the Production of Milk.** — HANSSON, N. in *Meddelande No. 85 från Centralstalten för Försöksvdsendet på Jordbruksområdet, Husdjursafdelningen* No. 12.

During the last quarter of last century the method for calculati the nutritive value of the various fodders on the basis of their chemi composition which prevailed in agricultural literature was little followed Scandinavian breeders. It was too complicated, and moreover experier had shown that the values calculated did not always correspond to th effect; this was especially noticed in comparing coarse fodders (hay a straw) with concentrated foods.

In 1887, in Denmark, feeding experiments were undertaken with t object of determining the proportions in which the various foods could place each other in a practical feeding ration for cows without affecti their production. In the economic control of dairies carried out by the co trol associations the relative values thus found and expressed in "food unit were increasingly used, especially for the practical calculation of ratio The number of these associations has increased to such an extent since t beginning of the century, that they at present exert a directing influence animal husbandry in Sweden as well as in Denmark. On the other hand t experience gained by the work of control has contributed to confirm and some cases to correct the relative values of all the common foods.

The correctness of the values in food units was later confirmed by Ke ner's starch values, which, like the values in forage units, were a measu of the total effect of the fodders. One food unit corresponded on average 0.605 kg. (1.33 lb.) of starch value, but there were exceptions; thus the star value of foods rich in carbohydrates, such as coconut and maize cakes, w equal or even superior to that of cakes rich in protein, whilst the value these latter in food units, based on feeding tests, was decidedly superio

This difference is further confirmed by numerous feeding experimen which in Sweden have included 32 different foods. (Summarized in *Fö lings Landw. Zeitung*, 1909-1913). With the aid of the results of these tes the writer has shown the cause of the differences between the two metho of calculating the relative values of foods. By means of the results of tes made with cakes and soya meal, he was already able to show in 1909, that in milk production protein in quantities greater than the necessary minimum had, in comparison with nitrogen-free substances, a value superior to tha found by Kellner in his experiments with fattening animals.

This conclusion was confirmed by feeding experiments conducted the writer from 1910 to 1912 with peas, vetches and beans. He replac quantities equal in food units, giving 2 kg. (4.4 lbs.) of a mixture of equ parts of earthnut cake, bran and wheat instead of the same quantity the ground pulse above mentioned, that is to say that 1.12—1.16 kg. (2.4 2.55 lbs.) of starch value in the mixture of cake and bran are replaced b 1.33-1.38 kg. (2.93 to 3.04 lbs.) of starch value in the pulse, and yet in th series of experiments the latter gave an average production of milk and fat inferior to that yielded by the mixture of cake and bran. Thus th

urch value did not prove an exact measure of the feeds used for the pro- ction of milk.

According to the writer, this difference between Kellner's starch values d the Swedish and Danish food-unit values depends upon the fact that ellner's figures are the result of fattening experiments with steers, whilst e Swedish food-unit values are founded on experiments with milch-cows. other words the starch values serve to measure the value of the various ods from the phint of view of the formation of fat, while the food units con- fer them from that of the production of milk. Fats, carbohydrates and ude fibre have the same value in the two cases, but protein is more vantageously used in the production of the milk proteins than in the tting on of fat.

It must be considered that the calorific value of the proteins of the fod- r is so well utilized in the formation of similar bodies in the milk, in the etus and in the digestive liquids, that the effective value of the digestible otein of the fodder in relation to that of the digestible carbohydrates cor- sponds to the full calorific value of the protein.

The writer's calculations have verified the correctness of this opinion, when he reckoned the digestible protein of the fodder at 1.43 (correspond to the total calorific value of the protein) instead of at 0.94 (Kellner's ure), the calculated values corresponded to those which resulted from the ding experiments. The writer has thus introduced a method for cal- ating the milk- producing value which only differs from Kellner's method the calculation of the starch value as regards the figure for the reduction protein.

The following is an example of such a calculation for earthnut cake, the al relative value of which was 98.

Digestible protein	39.6	× 1.43 = 56.6
Digestible fat	7.2	× 2.41 = 17.4
Nitrogen-free extract 21.2	21.9	× 1.00 = 21.9
Digestible cellulose. 0.7		
	Total . . .	95.9

$$\frac{95.9 \times 98}{100} = 94.0 \text{ kg. (206.8 lbs.) of milk-producing value.}$$

The effect of 1kg. (2.2 lbs) of digestible carbohydrates is thus the unit ilk-producting value, as it is of starch value.. The difference between e two notions is that the starch value considers protein only according s effect on fattening, while the milk-producing value expresses the effect odder in the case in which all the calorific energy of the proteins is uti- l for the production of milk. The two values are very nearly the same fodders poor in protein, the difference being insignificant for hay, green l and cereals, but more marked for pulse and cakes rich in protein. The ciple of recognizing in foods rich in protein a feeding-value higher than r starch value is not opposed to Kellner's opinion on the starch value. e calculates the money value of the foods on the basis of a fundamental e, not only per kilogram of starch value but also per kg. of protein.

The table given on the neet page gives the necessary figures for calculating

Milk-producing value of foods.

	Content of digestible matter					Value for the production				
							per 100 kg.			
	Protein	Starch	Fat	Nitrogen-free extract	Fibre	Total relative value (Wertigkeit Kellner)	Starch value	Milk-producing value	1 Food unit = kg. of fodder	Ratio of milk producing
Earthnut cake	39.6	1.4	7.2	21.2	0.7	98	74.9	94.0	0.8	0.
Sunflower cake	28.7	2.6	10.3	19.0	3.5	95	70.6	83.9	0.9	0.
Coconut cake	12.5	0.4	7.1	29.9	9.4	100	68.2	74.3	1.0	0.
Barley	6.5	1.0	1.7	6.7	1.4	99	72.0	75.2	1.0	0.
Mixture (½ barley, ½ oats)	7.4	1.0	2.7	52.1	1.9	97	67.4	68.2	1.1	0.
Oats	7.7	1.0	4.0	44.7	2.3	95	59.6	63.2	1.2	0.
Peas	17.2	3.0	0.9	48.8	2.5	98	68.0	76.2	1.0	0.
Vetches (seed)	20.0	2.9	1.6	45.8	2.8	96	65.9	75.3	1.0	0.
Clover hay	5.5	3.0	1.7	26.0	11.3	70	32.0	33.9	2.2	0.
Mixed hay (clover and grasses)	4.2	1.5	1.1	25.3	12.1	67	29.1	30.5	2.5	0.
Meadow hay	4.2	1.3	1.0	24.3	15.5	64	29.2	30.5	2.5	0.
Barley straw	0.7	0.2	0.5	19.0	21.3	45	18.9	19.0	4.0	0.
Mangolds	0.4	0.6	0.1	7.4	0.7	87	7.5	7.7	10.0	0.
Swedes	0.5	0.5	0.1	8.1	0.8	87	8.3	8.5	9.0	0.
Turnips	0.4	0.5	0.1	5.2	0.7	87	5.7	5.9	12.5	0.
Green food (oats and vetches)	1.4	0.8	0.3	4.9	2.3	80	7.3	7.8	10.0	0.

the milk-producing values, as well as the values of the foods usually em ployed in the feeding of live stock. In order to institute a comparison, th writer has also inserted the starch values and the quantities equal to a foo unit according to the scale employed in Sweden. The conformity of the units to the new values is shown by the figures of the last columns. A is seen in the last column, one food unit is generally equivalent to abou 0.75 of the new values, that is to say that in a mixture of fodders sati fying the protein requirements of cows and calculated according to th above-mentioned method, 1 kg. of barley, 1.1 kg. of the dry matter o roots, or quantities of other foods according to 0.75 kg. of milk-producin value, are to be considered as one food unit. As the digestible carbohydrate which serve as unit of this valuation are used on an average for direct produc

n with only 3.6 calories per gramme, one food unit contains about 2.7 cal-
es utilizable for the production of milk. In order to satisfy the require-
nts as to protein, the food unit must contain 100 gms. of digestible protein
the maintenance ration and 135 gms. in the productive ration.

The writer's method of calculation has removed one difficulty which
s much felt in the valuation of the various fodders necessary in the con-
l calculations required at dairies. The values of food units are all based
feeding experiments made with fodders of average quality and are only
plicable to such fodders. But in practice it often happens that fod-
s of superior or inferior quality have to be used. In such cases, there
s not been hitherto any method for determining exactly the nutritive
lue. Roots may be valued on the basis of their content in dry matter,
ich is almost entirely digestible and of equal nutritive value. It is
ecially in the case of coarse fodders which have a higher and more
ied content of undigestible fibre that a base has been wanting for the
uation of nutritive value.

By means of the new method of calculating the milk-producing value
fodders, this difficulty has been overcome and such a valuation may also
made for fodders of the most varied composition, provided their content
digestible matter is known. By this possibility of determining the nutri-
e value of fodders on the basis of chemical analysis, the Scandinavian
uation by food units, which was hitherto purely empirical, has received
ientific basis.

A Study of the Correlation between Racing Performances and Breeding Value in Brood Mares. — ROBERTSON, J. B. in *The Bloodstock Breeders' Review*, Vol. II, No. 9, pp. 185-197. London, October 1913. BREEDING.

The writer attempts to ascertain whether there exists any association
veen a mare's racing ability and her power to produce offspring possessing
-class racing qualities. With this object in view he has extracted from
Racing Calendar the performanecs of the dams of the winners of the

	Dams of 189 classic winners 1862-1913	Dams high class performers	Random sample of 1000 brood mares G. S. B. Vol. XXI.
	per cent.	per cent.	per cent.
p I. — Never ran	14.8	21.2	36.5
p II. — Ran, but showed no form .	13.2	13.7	29.5
p III. — Showed moderate form . .	20.6	20.0	14.5
p IV. — Fair winners	25.4	26.3	16.6
p V. — Good winners	13.8	10.8	2.5
p VI. — High-class race mares . . .	12.2	8.0	0.4

Derby, Oaks, St. Leger, and Two Thousand and One Thousand Guine during the last 30 years and classified them. The result of these investig tions is given in the first column of the accompanying table. In the se cond column are given the dams of racehorses which were not three-yea old classic winners, but yet were high-class performers. In the third colum are included 1000 mares of the General Stud Book (G. S. B.) taken at random Thus the performance of the dams of winners and high-class performe can be compared with the average performance of brood mares of the G. S. I

It will be seen from the above table that over 12 mares in every hun dred which have bred classic winners, were either classic winners themselv or very high-class race mares, whereas in the General Stud Book there a only 4 mares in every hundred which could be so described. Considerin the first two groups of the table it will be seen that 66 per cent. of the mar in the General Stud Book either never ran or showed no form, as against 28 per cent. of the dams of classic winners. In fact whichever group be ex mined the result points to the conclusion that the chance of breeding classic winner is very much greater from those mares which have racing pe formances to their credit than from the others.

44 – **Colour Inheritance in Swine.** — SMITH, W. W. in *American Breeders Maga* Vol. IV, No. 2, pp. 113-123, Washington, D. C., 1913.

As a result of 12 matings between pigs of the white Yorkshire bre and of the black Berkshire or Poland China breeds, 115 individuals we obtained, all white. Crossbred Yorkshire × Berkshire of the F_1 generati were mated together and produced 26 pigs of which 20 were white and black splashed with white, while crossbreds mated with Berkhire gave 65 p of which 32 were white and 33 black with some white. All the recessi blacks of the F_2 generation carried more white than the original bla parent.

The offspring of a white $^3/_4$ Poland China sow by a Poland China si consisting of 21 individuals, could be divided into four classes, *viz*:

11 black with a little white;
2 white » » black;
1 half white and half black;
2 all white.

These results show the complete dominance of white over black in th generation and a general tendency for the original parent colour to expressed separately in the F_2 generation in the proportion of 3 domina to 1 recessive. But the fact that in nearly all cases the recessive black the F_2 generation carried more white than the original black pare suggests that each colour may be made up of a number of germinal fact rather than of a single factor.

Stock-Breeding in Tripolitania. The Export of Stock and of the Products the Stock-Breeding Industry. — *Ministero delle Colonie, Bollettino di Informazioni*, ar 1, No. 4, pp. 163-206. Rome, October 1913.

Stock Production and Export. — The annual production of cattle in litania amounts to 50 000 head. The animals are exported to Malta icily. In 1907 and 1910, Italy imported Tripolitan cattle to the of £968 and £57 140 respectively.

These animals are small, powerful, strongly built, and average 660 lbs. ight; before the war they fetched about £6 per head. The Orfella ebel breeds are considered the best; the former are good milkers, and tter excellent draught animals. The milk yield of an Orfella cow during months' lactation period is reckoned at 220 to 260 gallons. The would be more profitable, if provision were made for water and fodder g the dry season, and due attention paid to the castration of unsatis- y bulls, selection, the increase of the herds, and the control of cattle es. In order to increase milk production, the cows should be rigor- selected, and they should be supplied with green forage during a r period of the year. Cattle are sold for ready money at the market, ither at a valuation, or according to their live weight.

The number af horses bred annually amounts to 10 000 and the value ose exported every year is estimated at about £4000. Of these ex- d animals, one-third go to Malta and two-thirds to Sicily. The Turkish nment used to encourage horse breeding by prohibiting the export ood mares and, at times, that of stallions also. The best horses are ced in the districts of Tarhuna and Orfella; only stallions come into arket. To promote and improve horse breeding, suitable measures d be adopted, such as better keeping, careful selection, and perhaps stablishment of stud-stations and other similar reforms.

sses are much bred in the interior, about 50 000 being produced annu- The Tripolitan ass is usually black and stands 10 hands high on an ge. It is an excellent worker, and its average price is £1 12 s.

The annual production of sheep is estimated at 100 000. Of the exported 10 per cent. go to Malta, the rest almost exclusively to Egypt. Three s are distinguished: the Orfella sheep, the fat-tailed Gebel sheep, and rge woolless Sudan sheep. The Tripolitan sheep is exported as a rule s mutton, but is also exported frequently to Malta and Sicily for breed- urposes. In Tripoli, where fat is employed for seasoning, the fat- l breed is predominant. The average weight of these animals is 77 the rams weigh 88 lbs., and lambs at 4 to 6 months 40 lbs. The yield during the lactation period, which lasts 3 or 4 months, amounts ½ gallons. The sheep are very heat-resistant and fairly prolific; ccount of the numerous diseases which prevail, they have rather fleeces. In order to improve them, it would be necessary to induce atives (to whom all the flocks belong) to pay more attention to the igement of the animals, and to castrate and fatten all unsatisfactory Crossing with European breeds would, at present, be useless. The ge price in Tripoli per head is £1, for rams £1 4s and 16s to £1 ambs.

Goat keeping is very general in Tripolitania ; the breed is of ave size, and the animals are black. Their live weight amounts to 66 t lbs. A kid at 2 to 3 weeks old weighs 11 to 15 lbs. Cloth is made from shorter finer hair, and ropes from the longer. Under favourable ditions, a goat gives 1 3/4 pints of milk daily; the milk yield of the w lactation period amounts to 13 to 33 gallons. The natives prefer to the goats' milk with ewes' and cows' milk when making butter and ch The breed could be improved by better feeding, systematic organisation o the sale, and rigorous selection of the animals.

Tripolitania possesses two important breeds of fowls: the Arab and Turkish. The first are good layers ; they are chiefly kept in the int of the country and fowls are often sent to Malta and fetch 4*d* per lb. Turkish fowl is somewhat larger and fattens better, but is not such a layer as the Arab. The hens weigh 4 ½ lbs. and the cocks 5 ½ lbs. O breeds of poultry are little kept in Tripolitania.

The Production and Export of Animal Products. — The annual p production of hides is valued at £26 000 ; one quarter is used in the cou and the remainder is exported. France and America are the best cus ers, after which come Greece, Turkey and Asia Minor. The skins dried in the shade, and then treated with a 4 per cent. solutio potassium arsenate. Goat skins are worth, on an average, 1*s* 7*d* cow and ox hides £2 16*s* 5*d* to £3 12*s* 7*d* per cwt. and camel s from £1 8*s* 3*d* to £1 16*s* 3*d* per cwt. Many hides and skins fetch l prices, because they are dirty, contain holes, or are attacked by eases (especially warbles). Prices are highest in summer and aut as a rule, and lowest in spring and winter. The skins from the S are exclusively those of goats, and are brought by caravans to Tripoli. trade was at one time of much importance, but is now insignificant, o to establishment of water and railroad communication. From 1887 to the average annual value of the skins exported from the Sudan was £32 to day it is still £12 000. The goat skins are tanned in the Sudan, and us dyed red or yellow for the market. The natives use for tanning vege substances such as "gedari", "afs-el-battum", "adze", "burbu" pomegranate bark. The natives select in Tripoli those skins which are tined for export to America. They take the average weight of 12 as a criterion ; this should be between 11 and 13 lbs. Delivered on board sh Tripoli such skins fetch from 1*s* 5*d* to 1*s* 7*d* per lb. The goat skins are ly exported to Boston, for which port they are made up into bales, containing 25 doz. In Boston, the skins are thoroughly tanned, and sold to be made into boots, etc. So far, the attempt to introduce Sud skins into the European markets has met with no success.

Before the war, the annual wool production of Tripolitania amou to 3 300 000 lbs., while 1 760 000 lbs. were exported, 1 320 000 lbs. sent to France and 440 000 to Italy. The production depends upo supply of forage, and in years of drought is scarcely sufficient to meet requirements. The wool is coarse ; it is unequal, except in the best fl and is usually grey or black, and often speckted with white, but rarely

te, and its quality is inferior. During the sale season, *i. e.* from April till
, unwashed wool fetches 3 ½ *d* per lb., and washed wool 7 ¼ *d* to 8 ¼ *d*.
principal markets are Marseilles and Genoa; after these come Triest
Malta. Marseilles offers the advantage of a more ready sale, Genoa
t of greater net profit. Bengasi wool is better, and consequently some-
it dearer than the Tripoli product.

Formerly, Tripoli exported annually about 250 tons of bones, valued at
0; this export does not now exceed 120 tons, estimated at £600. Of these
es 90 per cent. are cow and sheep bones, while 10 per cent. are
se of horses and asses. Most of the bones exported go to France and
ly.

Before the war, the egg export trade was of considerable importance.
m 9 to 10 million eggs were exported annually, of which about half
t to Italy. Italy was a customer in the spring and winter, France in
uary and February, while eggs were exported to Tunis in the summer,
to Malta throughout the year. The price varied in winter (including
cost of packing) from 9*s* 6*d* to 11*s* 10*d*, and in summer between 7*s* 11*d*
8*s* 8*d* per 1000, at the harbour of Tripoli.

- Studies in Milk Records. — (1) GAVIN, W. The Interpretation of Milk Records. — *Journal of the Royal Agricultural Society of England*, Vol. 73 (1912), pp. 153-174. ondon, 1912. — (2) ID. The Influence of Fœtal Growth on Yield. — *Journal of Agricul-ural Science*, Vol. V, Part 3, pp. 309-319. Cambridge, 1913. — (3) ID. On the Accuracy f Estimating a Cow's Milking Capability by her First Lactation Yield. — *Ibid.*, Vol. V, Part 4, pp. 377-390. Cambridge, 1913.

1. The writer, who holds the position of Scientific Expert to Lord Ray-h's Dairy Farms, has made a statistical study of the milk records of 5 cows accumulated in the course of 24 years. He points out that in lies of the inheritance of milk yield in cows, it is difficult to assign a defi-: numerical value to the inherent milking capacity of each individual, uch figures as total yield per calf or per calendar year, average per week, , are subject to wide fluctuations from external causes; to make them alue, it is necessary to enumerate in every instance the particular cir-stances in which the cow in question has been placed during the given iod. In a statistical study this is naturally impossible, hence the ne-sity of defining a cow's milking capability by one single unqualified figure.

He classifies the external circumstances affecting yield under the fol-ing headings:

1) Age of cow.
2) Number of weeks in milk.
3) Number of weeks rest before calving (*i. e.* since the end of the pre-us lactation period).
4) Interval between calving and subsequent service.
5) Time of year of calving.
6) Food, weather and general treatment.

He then proceeded to select a figure which should be affected by the nimum number of factors and to estimate as accurately as possible the

effect of those influences under which it does fall. After a preliminary examination of the data, three figures were selected for comparison:

I. Average yield per day from the 5th to the 12th week after calving, or A.

II. Maximum yield on any one day, or M.

III. Revised Maximum, being the maximum day-yield reached or exceeded three times in any given lactation (*i. e.* the highest figure common to three entries in the record book), or R. M.

These figures should be outside the influence of the external factors 2), and little effected by 4). The writer proceeded to compare their variability, and also their correlation with lactation totals, or I,. T. (total yield per calf) both in normal and abnormal lactations. (Table I).

TABLE I.

	Abnormal (short)	Normal Lactations			Abnormal (long)	All Lactations
Weeks in milk	30–34	35–45	40–45	41–45	55–60	
No. of cows	167	1 233	696	590	172	2 665
Variation coefficients:						
I,. T.	26.45	25.72	25.28	25.46	26.76	31.69
A.	25.98	25.78	26.77	27.13	28.54	27.56
R. M.	26.08	24.77	—	26.11	—	26.44
M.	25.83	24.68	25.55	25.05	28.32	26.01
Correlation with I,. T.:						
A.	+ 0.885	+ 0.858	+ 0.879	+ 0.878	+ 0.873	
R. M.	+ 0.831	+ 0.844	—	+ 0.876	—	
M.	+ 0.823	+ 0.839	+ 0.869	+ 0.876	+ 0.832	

From this table it would appear that M is the least variable function of a cow's milk-production and that all the correlation coefficients seem high enough to justify the use of any of the three above figures as determinants of a normal cow's yield. The mean A, R. M., and M. were all calculated for the different lactation periods given above and showed very little variation. There was if anything a slight tendency to rise with the length of the lactation, but the point requires more investigation.

Now of the three figures A would be exposed to greatest error from those luences which are general in character and tend to act in the same direc- n for considerable periods, such as temperature, time of year, food, me- od of feeding, rainfall, housing, etc.. ; for during an unfavourable period ich would depress A, it might well occur that on one day favourable cumstances combined to allow the cow to show what her real capability is, while in a lactation period where the conditions were favourable A uld be increased while M. would remain the same. On the other hand ords based on a single entry are liable to serious errors such as late lking, extra food, clerical mistakes, etc... To avoid both extremes the iter finally selected the R. M. as the most suitable unit; it possesses e further practical advantage over A of requiring no calculation. He en estimated to what extent the R. M. was influenced by certain dis- rbing factors:

Influence of Age. — The mean R. M. for 110 cows was as follows:

Mean R. M. with	1st	calf or mean	$R.M_1. = 9.8$ quarts
»	2nd	»	$R.M_2. = 12.8$ »
»	3rd	»	$R.M_3. = 14.4$ »
»	4th	»	$R.M_4. = 15.3$ »
»	5th	»	$R.M_5. = 15.8$ »
»	6th	»	$R.M_6. = 16.0$ »

When these values were plotted, the curve was smoother than that ob- ined from the L. T. of the same 110 cows or than that of calendar year tals of 125 other cows. The maximum is not reached till the 6th calf, t there is little increase after the 4th calf. The writer suggests a rough rrection for estimating the mature capability of a cow from R. M_1 M_2, R. M_3, but the subject is discussed in detail in a subsequent paper.

Influence of season of calving. — The mean R. M. for cows calving each month of the year was calculated on a total of 1418 cows and given in the following table (II).

The highest means of R. M. occur with cows calving in April and May, id the lowest in August calving cows, corresponding to the supply of natu- l succulent food. Mean monthly L. T. of 731 of the cows with normal lac- tions showed very similar variations, but maximums occurred with cows lving in November and December, and then gradually decreased till ugust. The writer tried various corrections to reduce the error due to sea- n of calving and finally suggests the following, which proved the most itable as a provisional measure.

For cows calving April and May . . .	Deduct	5	per cent.	from	R. M.
» July . . .	Add	5	»	to	»
» August. .	»	10	»	»	»

Influence of period of rest. — 347 cows were divided into four groups ording to the number of weeks rest they had before calving, and the an R. M. for each group was estimated. The figures were practically ntical, so no correction need be made on the R. M. on this account.

TABLE II.

Month of calving	No. of Records	Mean R. M.	Deviation of month mean from mean for year
		quarts	
January	136	14.3	+ 2.1 per
February	175	14.6	+ 4.2 "
March	104	14.7	+ 5.0 "
April	73	15.5	+ 10.7 "
May	87	15.3	+ 9.3 "
June	139	13.2	— 5.7 "
July	153	12.7	— 9.3 "
August	112	11.5	— 17.9 "
September	67	14.8	+ 5.7 "
October	125	14.4	— 2.9 "
November	104	13 8	— 1.4 "
December	143	13.8	— 1.4 "
		Mean 14.01	

2.—In this paper are given the results of an investigation into the in fluence of the time of service on R. M. 1419 records were first examin to determine the time after calving at which the maximum yield first occu The records were divided into five groups according to whether the co calved in (I) April to November inclusive, (II) December, (III) Janua (IV) February, (V) March, and tabulated according to the time which h elapsed between the time of calving and the date of maximum day yi (Table III).

It will be seen that 84 per cent. of the total number of cows reached t maximum day yield by the 8th week after calving, 92 per cent. by the 1 week and 97 per cent. by the 16th week. Three-quarters of the 8 per cent. t had not reached their maximum by the 12th week were January and F ruary calvers, leaving only 2 per cent. for cows calving during the remain of the year. Taking the Jan. and Feb. calvers by themselves, only 72 per ce of the former gave a maximum before the 12th week, but 97 per cent. h given it by the 20th week. February calving cows alone shew correspondi figures of 74 per cent. for the 12th week, and 100 per cent. for the 20th. Wh these figures are plotted in curves superimposed on one another according

TABLE III.

Percentage of cows reaching maximum day-yield during:

Date of calving	Weeks after calving							No. of records.
	1st to 4th	5th to 8th	9th to 12th	13th to 16th	17th to 20th	21st to 24th	25th to 28th	
il to November .	67.5	29	2	0.5	0.5	—	0.5	862
ember	55	27	10	0.5	3.5	4	—	141
uary	40.5	28	3.5	12.5	12.5	3	—	136
ruary	41.5	15	17.5	24.5	1.5	—	—	176
rch	23	31.5	38.5	7	—	—	—	104
months	57	27	8	5	2	1	—	1419

TABLE IV.

Average daily yields.

Weeks after calving	No. of weeks after calving when served					
	5th to 8th	9th to 12th	13th to 16th	17th to 20th	25th to 28th	37th to 40th
d and 4th . . .	100	100	100	100	100	100
erage daily yield in quarts) . . .	(14.8)	(14.1)	(13.7)	(14.0)	(13.3)	(13.2)
h—8th	97*	99	99	98	98	97
h—12th	88	90*	86	90	89	88
th—16th . . .	81	82	77*	82	77	79
th—20th . . .	73	73	69	73*	71	71
st—24th . . .	63	66	63	66	67	64
th—28th . . .	*52*	59	58	61	63*	60
th—32nd . . .	*40*	*50*	*51*	55	59	56
rd—36th . . .	*23*	*34*	*40*	*47*	56	51
th—40th . . .	—	—	—	—	48	47*
st—44th . . .	—	—	—	—	*35*	45

* Period of service.
Time after which the foetal growth appears to influence the yields is entered in italics.

their calendar dates, it becomes evident that the delayed maxima are in case reached about the same season of the year, namely April and May, the cows respond to the extra stimulus of abundant and succulent green

247 records of cows calving in May and June were then examine determine the influence of the time of service. The cows were divided up six groups according to the length of time elapsed between calving time of service, and their average daily yield was estimated for 44 we (see Table IV, on previous page).

It would seem that in no case has foetal growth reduced the yield compared with that shewn for the same period by groups where service not occurred) sooner than 12 to 16 weeks after service. In the case of grou II, and V, it appears to have had no influence for 16 to 20 weeks. Sh then, 12 weeks at the very least (and probably 16 to 20 weeks) must el between service and any fall in yield due to foetal development, and s 97 per cent. of the cows were found to have reached their maximum yield within 16 weeks of calving and 99 per cent. in 20 weeks, the cha of the Revised Maximum being affected by time of service are seen t very slight.

The table also shows that the milk yield diminishes generally in absence of gestation and that the decrease due to this cause may be tinguished from that caused by foetal growth. The writer also points that the rate of fall in both cases is very similar.

3. — This investigation was based on the records of 336 cows which 5 or more calves. Lactations were measured as R. M. in quarts through The mean R. M. and variation coefficients with the different calves as follows:

		Variation coefficient
Mean R. $M._1$	9.3 quarts	21.2
» R. $M._2$	12.8 »	16.6
» R. $M._3$	14.2 »	17.8
» R. $M._4$	14.9 »	16.6
» R. $M._5$	15.4 »	17.8

The coefficient of variation is 21.2 with the first calf, after which it to the neighbourhood of 17. Determinations made from a smaller n ber of cows revealed a tendency to rise again after the 5th calf. Th creased variability of the 1st lactation yield seems more likely to be du the greatly varying condition in which heifers are brought into the n ing shed than to have any physiological basis. Differences in feeding general treatment, and most of all in age, must influence very greatly first lactation yield, and this influence must tend to decrease as the mil career advances. In considering the correlation between the first and sequent lactation yields, it becomes necessary to decide on a figure t present a cow's mature capability. For reasons analogous to those for w R. M. was selected as the figure to represent a lactation yield, the *maxi* R. M. was taken to represent a cow's mature capability, and the follo correlation coefficients were obtained:

R. M_1	with	Max	R. M.	.394
R. M_2	»	»	»	.452
R. M_3	»	»	»	.506
R. M_4	»	»	»	.605
R. M_5	»	»	»	.762
Average of R. M_1 + R. M_2	»	»	»	.526
R. M_1		with	R. M_2	.437
R. M_2		»	R. M_3	.388
R. M_3		»	R. M_4	.576
R. M_4		»	R. M_5	.527

The correlation between R.M_1 and Max. R.M. is low, but can be substantially increased by taking the average of R.M_1 + R.M_2, and the fact that the lationship between all successive lactations is somewhat distant makes ıe correlation between R. M_1 and Max. R. M. more important than the alue of .394 alone would indicate.

With regard to the estimation of mature from first-calf yield, a simple ıctor will not suffice, since cows starting badly tend to increase to a greater roportion of their first-calf yield than those which begin with a higher figure. ecourse must therefore be had to regression coefficients, which are given the following table, together with the probable error of the estimate 'able V).

TABLE V.

Lactation	Regression Coefficient	Probable error of estimate
1st	.57 ± 0.050	1.77 quarts
2rd	.58 ± 0.046	1.66 »
3rd	.60 ± 0.037	1.73 »
4th	.73 ± 0.035	1.58 »
5th	.82 ± 0.026	1.28 »
Average 1st + 2nd	.79 ± 0.053	1.58 »

An example is given of the use of these coefficients, showing that if ow gives R. M_1 = 7.3 quarts, which differs from the mean by--2, then Max. R. M. will be = mean Max. R. M. — (2 × .57)

= 17.14 — 1.14

= 16 quarts.

rther the chances are *even* that this estimate is correct within the limits 1.8 quart. The inaccurracy is likely to be greater than this, since re-ssion of R. M_1 has not yet been shewn to be linear.

Table VI is given for estimating the Max. R. M. from R. M_1, and fr the average of R. M_1. and R. M_2..

TABLE VI.

R. M_1	Calculated Max. R. M.	Limits of probable error	Lactation total corresponding to Max. R. M.
qts.	qts.	± 1.7 qt.	gallons.
5	14.6		685
6	15.1		709
7	15.7		733
8	16.3		757
9	16.8		78:
10	17.4		80.
11	18.0		82;
12	18.5		851
13	19.1		874
14	19.7		898
15	20.3		921
16	20.8		944
Average R. M_1 + R. M_2		± 1.6 qt.	
7	13.7		651
8	14.5		684
9	15.3		717
10	16.1		750
11	16.9		783
12	17.7		816
13	18.5		849
14	19.3		882
15	20.1		915
16	20.9		948

315 cows were also divided into three classes according to whether ir R. M_1 was under 10 quarts, 10 to 12 quarts, or over 12 quarts, and ir mean R. M. was calculated for subsequent lactations. (Table VII).

TABLE VII.

Class	No. of cows	Mean					Average of all lactations	
		R. M_1	R. M_2	R. M_3	R. M_4	R. M_5	R. M.	Corresponding lactation total
		qts.	qts.	qts.	qts.	qts.	qts.	gallons
5–9 quarts .	153	8.1	11.3	13.7	14.4	15.4	12.6	604
10–11 » .	112	10.4	13.3	14.7	15.3	15.9	13.9	658
12–17 » .	50	13.0	14.9	16.1	16.4	16.9	15.5	724

Assuming milk to be worth 8*d* a gallon, an average cow of class A would e a return of £20 more than an average cow of class C. In practice it ears that cows of class C should be discarded after their first calf unless / extenuating circumstances are present, in which case a more reliable gment can be formed of the cow's subsequent value by the mean M_1 + R. M_2. Cows of Class B will probably pay to keep, but will bably not turn out high yielders, while Class C will tend on the whole maintain a good proportion, though not all, of their original start.

In conclusion, the writer points out with regard to the practical appli- ion of his results, that the definition of a cow's mature capability by ans of her Max. R. M. implies many years' delay and reduces the avail- e number of records by excluding all cows which did not reach turity. Therefore it is advisable that a uniform system should be med to deal with immature cows by calculating the Max. R. M. from data available in each case. It is possible that calculation will give many cases a less accurate result than a prognostication by a practical eder, but in such work it seems essential that personal bias should be luded.

- **Comparative Investigations into the Performance of the Breeds of Cattle kept in the Province of Saxony, Prussia.** — ERBINGHAUS, H. in *Deutsche Landwirtschaftliche Tierzucht*, Year 17, No. 40, pp. 473-476; No. 41, pp. 490-493. Hanover, October 3 and 10, 1913.

The writer avails himself of the results of five Milk Control Associations the province of Saxony (Naumburg a. S., Mansfelder Gebirgskreis, Droys- , Kayna and Witzenburg) in order to compare the cattle of the higher lands th those of the lowlands. The records of the five associations for 672 Sim- ntal cows and 956 Lowland cows show the following results:

In the the Simmentals, the live-weight is 132 lbs. greater than in the L lands and the increase in weight 20 lbs. greater. With almost the same c sumption of starch-values and the same number of milking days the Bl spotted cattle yield 504 lbs. more milk than the Simmentals, but as t milk contains 0.6 per cent. less fat they fall short of the Simmental in production of butter-fat by 23 lbs.

The records of the Naumburg a. S. Association (all large farms) ar follows:

Breed	No. of cows	Live-weight	Milk yield	Fa cont of m
		lbs.	lbs.	per c
Simmental	44	1 316	5 722	4
Red-spotted Lowland	117	1 247	6 653	3
Black-spotted Lowland	245	1 214	6 844	3

The increase in live-weight was greatest relatively in the Red-spott actually this and the Simmental were equal, and 40 lbs. more than the Bl spotted. The Simmental is again first for butter yield, exceeding the R spotted and Black-spotted by 27 lbs. and 10 lbs. respectively. There however, no marked differences in general performance between the th breeds.

The cows under the control of the Mansfelder Gebirgskreis Associa (large and medium farms) were 247 Simmentals, 450 Black-spotted L lands and 91 Harz. The result is that for the same ages and numbe milking days the Black-spotteds yielded the greatest quantity of m both absolutely and relatively, but were run very close by the Simmen The Harz cattle yielded 739 lbs. of milk less than the Simmentals. Th content (3.62 per cent.) and the quantity of fat (397 lbs.) were highes the Simmentals, while Black-spotted Lowland and Harz cows sho nearly the same quantity of fat (214.5 and 209 lbs.). As regards the consu tion of starch values the Black-spotted come first with 3963 lbs.; they followed by the Simmentals with 3898 lbs., and the Harz with 3656 Simmentals and Black-spotted Lowlands are relatively and absolu nearly alike, while the Harz cattle are somewhat inferior, notwithstand the fact that relatively they exceed the Black-spotted animals in the p of fat. Great differences, however, do not exist among these breeds.

A comparison of the performances of Simmental crosses (by Lowla local breeds, etc.) with pure Simmentals, from the data of three Asso tions, shows that the crosses give a greater increase of weight but a lo production of milk and fat.

Collecting the results of the investigations, it may be said that under same economic conditions Simmental cattle possess the following ad- ages and disadvantages in comparison with the other breeds.

1. — The live-weight and increase of live-weight at the same age are ter than in the other breeds.

2. — The yearly yield of milk is lower than in the Black and Red- ted Lowland cattle, but higher than in the Harz and cross-bred animals.

3. — The fat content and the quantity of fat produced are greater in the other breeds.

4. — The consumption of fodder expressed in Kellner's starch-values sentially the same as in the other breeds, the relative milk yield is , but the butter-fat yield and increase of live-weight are greater than e other breeds.

he Freiburg Pied Mountain Cattle and their Employment for Crossing ith the German Black-spotted Lowlands. — MÜLLER, P. in *Jahrbuch für ssenschaftliche und praktische Tierzucht einschliesslich der Züchtungsbiologie*, Year 8, , 1-87. Hanover, 1913.

n his very comprehensive article, the writer gives a detailed account of scent and history, as well as of the areas of distribution and breeding, Pied Mountain cattle native in the Freiburg Alps (Switzerland). The al home of this breed was in the north, whence it was presumably ht to Switzerland by the Celts many years before the Christian era. identical in origin with the Black-spotted Lowland breed, but received of other stocks (red Germanic cattle) at a very early period. Its r alone distinguishes it from the Simmental, to which it is in no wise or as regards performance.

The number of Pied Mountain cattle in Switzerland was reckoned in 1911 196, of which 18 732 were in the Canton of Freiburg, and 6 000 at of Berne (chiefly on the Jura). The Association of Swiss Pied Cattle lers (" Verband schweizerischer Schwarzfleckviehzüchter ") in 1911 ded 29 breeding societies (28 in the Canton of Freiburg and 1 in Neuen- with 45 bulls and 2574 cows.

The Pied Mountain cattle are exported to nearly all European coun- although only in small numbers, owing to their black colouring. for breeding purposes, when from six to nine months old, fetch £ 20 32 in the market in Bulle, while yearlings and two-year-olds make to £ 100. The latest aims of the breeder are to obtain more even herds nimals with black heads and a white star (the Dutch markings) d of with white heads. Of the total number of prize bulls in 1911 40 per cent. possessed the required black head. The writer gives the let, Marquis-Max and Kapitän lines as those which produce the best

he milk yield is from 5500 to 13000 lbs.; the average weight of an adult om a good herd is 1430 to 1540 lbs., while that of a bull at three to five may be as much as 2400 lbs. They kill at 58 to 65 per cent.

n the nineties of last century a considerable number of Pied Moun- attle were brought into Germany, especially for the improvement of

the Black-spotted Lowlands. The first crosses usually proved very sa factory, but further crossing tended to improve the fattening proper at the expense of the milk yield ; this led to the Freiburg bulls being longer employed. Further, attempts to breed Pied Freiburgs pure in G many found little encouragement from the authorities. At the present d Freiburg blood is still to be found in isolated Lowland herds in Thurin in Posen (sugar-beet farms) and in Kulmerland, West Prussia. The wri does not recommend this breed for crossing with the Black-spotted Lowla cattle, though he considers it adapted for special fattening purposes.

49 – **An American View on the Beef Cattle Situation. Present Status of Industry.** — *Communicated to the International Institute of Agriculture by* W. KENNEDY, *Director of Agricultural Extension, Iowa State College.*

The solution of the beef cattle situation is one of the most importa problems before our American people. This is something which concer every man, woman and child in the United States. For the first time the history of modern civilization our people are facing what appears be a near beef famine. It has been gradually approaching us ever sin 1907. The rapid increase in our population, thus a much heavier dema for beef, has caused high prices for all kinds of meat ; thus many farm have sold their breeding herds as well as the normal increase. The res has been a marked increase in demand and a very noticeable falling in supply.

The World's cattle supply. — A shortage at home would not be so s rious a matter from the consumers' standpoint, if there were an abunda supply in other countries. For some time the writer has been gathering da concerning the world's supply of cattle. It has been necessary to inclu all classes of cattle, because few countries outside of our own are able furnish separate figures for beef and dairy cattle. Fairly reliable figu have been obtained concerning the increases or decreases in the numb of both cattle and people in practically all of the leading meat produci and consuming countries of the world since 1900. These figures show co clusively that in all of the countries, except Australia and France, the increa in cattle production has not kept pace with the increase in the number people. A careful study of the same will clearly reveal the fact that the is a world-wide shortage of cattle and that the most alarming condit of affairs prevails in the United States.

The average increase in population is 19.9 per cent. and of cattle abo 2.18 per cent.

Free meats from foreign countries. — A great deal has been sa concerning the effect of putting meat on the free list. Some people ha claimed that it would insure an abundance of good beef for the Americ people at moderate prices. Others have maintained that the putting of me on the free list would drive the American farmer and ranchman out of t cattle raising business, on account of the low prices for meat and consequen of cattle on foot, which were sure to follow such legislation. A careful stu of the world's cattle supply would indicate that both factions are alm sure to be disappointed. That there is a world-wide shortage of be

Country	Population. Increase since 1900	Cattle	
		Increase since 1900	Decrease since 1900
e	2 %	2 %	—
any	16 %	4 %	—
d Kingdom	10 %	4 %	—
ia-Hungary	10 %	2 %	—
pean Russia	14 %	—	12 %
ia	35 %	20 %	—
l	20 %	—	20 %
ntina	40 %	—	6 %
alia	18 %	40 %	—
Zealand	30 %	16 %	—
d States	24 %	—	30 %

not be denied. This being true the placing of meats on the free list t likely to reduce appreciably the prices of beef to the consumer or the ailing prices for beef cattle. It is a well established fact that Europe eat hungry and must look to Argentina and Australia for its supplies, must thus bid against the United States or any other contender in the d's market. Even the most optimistic believers in free meat figure that he very outside not more than 4000 head of cattle per week, or 2 000 000 of beef, can be expected. This amount would barely furnish enough beef our annual increase in population. The very lowest estimates on our ual beef consumption place the amount at 56 lbs. per person, or for the le population 14 400 000 lbs. per day; thus our people would eat the re amount of articipated yearly importation of beef, some 100 000 000 in about seven days. This is a case where the law of supply and de- d will be the controlling factor in the establishing of prices.

Conditions in the United States. — The beef cattle industry of the United es is in a most precarious condition. Between January 1907 and January 3, the number of beef cattle in the United States decreased by 15 970 000 d, or about 32 per cent. During the same time our population increased ut 10 000 000 people. Conditions are going to be worse in the next or three years. A few weeks' study of any of the stockyards' markets convince the most optimistic person that there are altogether too many s, heifers and calves being rushed to market for the future good of the le business. It is a most pitiful sight, in the face of the present marked

shortage of cattle, to look over the daily receipts of our southern and western markets and find from 15 to 40 per cent. of the animals offered to be good young she stuff, just the kind that are needed for breeding purposes on the farms. This condition of affairs, if continued, can mean but one thing, namely fewer and fewer cattle in the years to come.

The Farmers' Duty. — It has been said that it is the farmers' duty to feed our people. This must necessarily include meat supplies, one of the most important of which is beef. If he is to fulfil his duty, he must get busy and raise more cattle. The present indications are that the future prices of beef cattle will be high enough to make the business a profitable occupation. Beef production must also be regarded as a factor in the conservation of the fertility of our soil. Soil conservationists claim that every time a bushel of corn is sold off the farm about 16 cents worth of fertility is removed. If corn be fed through beef cattle, but 5 cents worth of fertility is removed. About the same ratio prevails for the other grain and forage crops of the farm. These are factors worthy of careful consideration. There is no more important problem before our American people than the maintaining and building up of the fertility of our soil. Considering the labor involved, no line of farming is better adapted to soil-building than beef production.

Factors necessary to insure successful production of beef in the Corn Belt of America. — 1. — We must put more of our land under blue grass pasture. Many Iowa farmers are getting from $10 to $15 per acre from the blue grass pastures through the utilization of the same for beef production and cattle feeding purposes. This is an excellent way to help solve the labor problem on the farm, as beef cattle require but very little labor during the grazing season.

2.— The farmers of Iowa annually leave from five to seven million acres of corn stalks in the fields, thus very largely wasted. This is a wasteful method of farming, something unknown in the more densely populated countries where land is on a par with or higher in value than our own. A large amount of this waste could be, and will be, eliminated through the use of the silo, and then we shall be able to winter economically many beef cows and young stock on our farms.

3. — There should be some alfalfa grown on every Iowa farm. This is the heaviest yielding, most drought resisting, most palatable and most nutritious crop that can be grown on our farms. No other crop is so valuable in the growing and finishing of baby beef.

4. — The wise farmer will retain his heifer calves and cows for breeding purposes. Future prices for beef cattle should be as high as or higher than those of the present time; thus it is a short-sighted policy which leads a man to dispose of his breeding stock. This is a time when men should increase, not reduce their breeding herds.

5. — A man to be successful in any line of work must stay by the job. The fellow who is always changing never makes much progress. This is especially true of the beef business. No man can anticipate the high and

or the low ones, but the man who is always in the business is sure to profits when the other fellow is short, that is when the demand is er than the supply.

On the Relation between the Fat Content and Natatory Powers of Fish. — 'OLIMANTI, Osw. in *Biochemische Zeitschrift*, Vol. 56, Part 5-6, pp. 439-445. Berlin ovember 5, 1913. FISH

The writer tried to ascertain by means of chemical analysis whether a ence exists in the water and fat content of marine fish of the nekton and ios which whould account (independently of the swim-bladder) for the ent swimming capacity of these two groups. It is shown by the data in the tables, that the water content of the fish of the nekton is some less than that of those of the benthos, while the fat content of the for- is about three times greater than that of the latter. Further, within of these groups differences can be shown to exist in the water and fat nt; the less active the species, the more water and the less fat it con- , and *vice versa*. From this, the writer concludes that a correlation exists een the natatory powers and the specific gravity, or fat content, and ders that the fish of the nekton owe their greater swimming capacity nly to their larger swim-bladder, but also to their higher fat content.

Fur-Farming in Canada. — *A Report to the Commission of Conservation*, JONES J. W., p. 159, Ottawa, 1913. OTHER LIVE STOCK.

This report is a manual of fur-farming, giving an account of the history present extent of the industry, as well as practical details of the ranches hich the different kinds of animals are kept. The preparation of skins anufacture and the commerce of raw furs are also dealt with.

FARM ENGINEERING.

Experiments with Meyenburg's Motor Cultivator (1). — BRETIGNIÈRE, L. in *Journal d'Agriculture Pratique*, Year 77, No. 44, pp. 557-559. Paris, October 30, 1913. AGRICULTURAL MACHINERY AND IMPLEMENTS.

In order to investigate the difference between the work of the plough of the motor cultivator and its effect upon the crops, parallel experi- ts with wheat and oats were conducted in the autumn of 1912 at the cultural College of Grignon. Both cereals were sown on some plots had been ploughed and on others that had been worked with the motor vator.

The writer gives a short description of the machine and then passes on he experiments. The wheat was sown after potatoes and at the rate of lbs. per acre, and yielded, per acre, as follows:

(1) See No. 972, *B. Ang.* 1913. (*Ed.*).

	Weight of sheaves	Straw	Grain	Chaf
	lbs.	lbs.	lbs.	lbs.
On ploughed land	8 474	* 5 263 (62.1)	2 373 (28.0)	838 (9.
On land worked by motor cultivator	8 082	4 888 (60.5)	2 489 (30.7)	705 (8.

* The figures in brackets in this and the following tables refer to the percentage of straw and chaff.

On another plot, after carrots for feeding, wheat was sown at the of 107 lbs. per acre ; the results were the following :

	Weight of sheaves	Straw	Grain	Chaf
	lbs.	lbs.	lbs.	lbs.
On ploughed land	9 143	5 575 (61.0)	2 877 (31.5)	691 (7.
On land worked by motor cultivator	9 143	5 932 (64.9)	2 498 (27.3)	714 (7

The total average per acre was thus :

On ploughed land . . . . . 5 419 lbs. straw and 2 624 lbs. grain
On land worked by motor cultivator . 5 410 » » » 2 493 » »

The difference is too small to justify any conclusion being drawn favour of the plough.

The second part of the paper deals with experiments made with In experiment I the crop was harvested on August 7, in II in August both were threshed soon after.

The results were:

		Weight of sheaves	Straw	Grain	Chaf
		lbs.	lbs.	lbs.	lbs.
I	On ploughed land . . .	6 601	3 960 (60.0)	1 927 (29.2)	714 (10.
	On land worked by motor cultivator	4 460	2 462 (52.2)	1 195 (26.8)	803 (18.
II	On ploughed land . . .	5 855	3 690 (63.0)	1 952 (33.3)	213 (3.
	On land worked by motor cultivator	4 086	2 531 (61.9)	1.372 (33.6)	184 (4.

In the experiment with oats the difference in favour of the work accomıed by the plough is more marked.

Motor Plough Trials of the German Agricultural Society at Klein-Wanzeben. — LICHTENBERGER in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 86, pp. 1027-1029. Berlin, October 25, 1913.

The trials of motor ploughs organized by the German Agricultural ety (" Deutsche Landwirtschafts-Gesellschaft ") extended over a period early two months and consisted of a preliminary trial which lasted seven s' of the trial itself during three days, and of a thirty days' trial of reınce, followed by an eight days' brake test.

Nine outfits were presented; one of them, Kuers' plough (of Tegel · Berlin), belonged to the double-engine system; five were tractors ling the tillage implements attached to them, and the three last were or ploughs in which the machine and the plough are in one body.

TABLE I.

Plough	Date	Work per hour	Depth of work	Fuel consumed per acre	Cost of fuel per acre	Fuel used
	Aug.	acres	inches	lbs.	*s d*	
s	21.	1.047	10.6	17.53	1–7	Crude benzol
. . . . .	22.	1.040	7.5	14.99	1–5	»
. C.	21.	1.784	10.6	27.84	3–2	Citin
. . . . .	22.	1.935	7.5	21.86	2–6	»
ersal.	21.	0.800	10.6	—	—	Benzol
»	22.	1.278	8.9	22.84	2–11	»
pillar	21.	1.685	11.0	26.41	4–5	Benzine
»	22.	2.180	7.9	18.29	3–0	»
(large)	22.	0.988	8.3	33.36	4–3	Benzol
(small)	21.	0.680	10.6	34.17	4–4	Benzol
»	22.	0.741	9.1	26.50	3–5	»
l.	21.	1.354	11.2	23.73	3–0	Benzol
. . . . .	22.	1.621	8.7	18.29	2–3	»
s	21.	1.606	12.0	24.80	3–1	Benzol
. . . . .	22.	1.525	7.5	19.18	2–5	»
).	21.	1.290	10.4	21.28	2–9	Benzol
. . . . .	22.	1.389	8.1	19.36	2–6	»

The writer gives some data on the ploughs and reports upon th various trials. In the trial itself all the outfits worked in the same fie under conditions as similar as possible and under continuous individu control. Account was kept of the consumption of fuel, lubricants a water, of the area and depth of the work done, etc. Further, the quali of the work and the manner of working were also considered. The result of the two first days of the trial itself are given in Table I.

On the third day of the trial all the machines were submitted to dyn mometer tests both when running empty and with a full load; the dyn mometers used were self-registering instruments with glycerine filli and mounted on wheels.

The following table contains the data obtained during the thir days' resistance test:

TABLE II.

Plough	Number of days during which		Area ploughed			
			Depth			
	the plough could work	the plough did work	less than 7 ½ inches	7 ½ to 10 ¼ inches	more than 10 ¼ inches	Tota
			acres	acres	acres	acres
Kuers	33	31	81.5	—	228.8	310
I. H. C.	33	32	73.8	202.4	154.7	430
Universal	35	26	156.5	—	86.8	243
Caterpillar	33	33	133.5	46.5	314.3	494
Pöhl (small)	—	—	60.1	8.7	—	68
Akra	33	25	—	330.8	—	330
Stock	35	34	194.7	—	117.8	312
W. D.	32	31 ½	83.3	152.3	54.2	289

54 – **Maillet's Motor Tilling Machine.** — *Le Génie Rural*, Year 5, No. 47 pp. 5-6. Paris, June-July 1913.

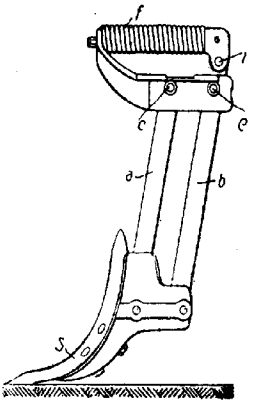
This is a description with illustration of a motor tilling machine whi is characterized by the tilling implement being screw-shaped. A sma motor causes the screw to revolve. The surface of the screw turns a furro slice over like a mouldboard would do. The diameter and the pitch the screw depend upon the kind of work in hand. The depth of the wo can be adjusted. The steering is accomplished by means of two handl fixed at the back of the machine, which is mounted on two wheels, and h been designed for use in vineyards.

- **Trial of a "Universal" Spring-Tooth Cultivator.** (8th Report of the Station for the Testing of Agricultural Machines and Implements at Hanover). — NACHTWEH, A. in *Mitteilungen des Verbandes landwirtschaftl. Maschinen-Prüfungs- Anstalten*, Year 7, Part 3, pp. 89-92. Berlin, 1913.

This "Universal" cultivator was handed over in the spring of 1910 to Station for testing agricultural machines and implements at Hanover trial. It was sent to the Gleidinger estate near Hanover and regularly d in the farming operations of the estate in spring and autumn.

The writer gives a detailed description of the implement, in which the de- e for regulating the depth of work is new. It consists o an endless screw h crank handle mounted on a support fixed at right angles to the axle of rear wheels. A further novelty is an angle lever, which forms an adjust- e connection between the intermediate frame and the pivoting fore-car- ge, by means of which, and by turning the above-mentioned crank ndle, the implement can be adjusted simultaneously in front and behind the required depth, even while working in heavy ground and without pping the team.

Another new feature is the build and arrangement of the teeth, which patented in Germany (No. 223 716). One of them is shown in the oining figure [illegible]



It consists of two parallel iron bars, *a*, *b*, fastened to specially formed s pieces, *c*. The rear bar, *b*, is prolonged above the cross piece and nected by a bolt, *i*, with a strong rod bearing round it a spiral spring, *f*, ch takes up and deadens the shocks that the tooth *S* encounters while king.

The writer gives, in the form of a table, the measures and the prices he different sizes in which the cultivator is built, and also the number raught animals required for each.

The conclusion drawn from a long-continued test is that this cultivator is a practical implement, suitably constructed for its work, which performs in a satisfactory manner.

56 – **Spring-Tooth Harrows.** — RINGELMANN, M. in *Journal d'Agriculture Pratique*, Year 77, No. 39, pp. 408-410. Paris, September 25, 1913.

The writer begins by the following results of observations made with three rigid harrows with vertical teeth:

	Harrows A	Harrows B	Harrows C
Effective breadth of tooth	0.71 in.	0.82 in.	0.98 in.
Average distance between the teeth measured at right angles to the direction of draught	1.69 in.	2.36 in.	1.77 in.
Average weight of each tooth	4.4 lbs.	4.2 lbs.	4.6 lbs.
Depth of work done	1 3/4 in.	2 in.	2 in.
Average traction power per tooth	4.84 lbs.	9.02 lbs.	11.44 lbs.
Average traction power per tooth and inch of depth	2.8 lbs.	4.5 lbs.	5.6 lbs.

He then gives the data obtained by experiments made with the spring-tooth harrows on the same day and in the same field as the three preceding harrows:

	Harrows E	Harrows F	Harrows G
Effective breadth of teeth	2.17 in.	2.17 in.	1.89 in.
Average distance between the teeth measured at right angles to the direction of draught	3.94 in.	3.94 in.	4.09 in.
Average weight per tooth	15.6 lbs.	15.6 lbs.	17.6 lbs.
Depth of work done	2 3/4 in.	3 1/4 in.	3 1/2 in.
Average traction power per tooth	69.3 lbs.	85.8 lbs.	44.6 lbs.
Average traction power per tooth and inch of depth	25.2 lbs.	27.4 lbs.	12.9 lbs.

From the above results the writer concludes that with an average of 1.2 inch breadth of tooth and a distance of 2.4 inches between the tines, a greater depth of work can be attained with spring-tooth harrows without increase of traction power.

57 – **Threshing with Steam Engine or with Electric Motor.** — TIETZ, P. in *Deutsche Landwirtschaftliche Presse*, Year 40, Nos. 82 and 83, pp. 979-981 and 995-996. Berlin, October 11 and 15, 1913.

In order to obtain reliable data on the economic difference between these two systems of producing power, the Magdeburg Steam Boiler Association ("Magdeburger Verein für Dampfkesselbetrieb") carried out in February and March 1913 extensive comparative experiments in two farms. The

er gives data on the machines used, on the loss of grain, on the consump- of fuel, etc.

In the second part of the paper the general pros and cons of the two er systems are discussed, and with the aid of two tables the costs of ric and steam threshing are compared. These experiments show that alleged superiority of electric threshing as to cleaner and cheaper work not correspond to reality.

Trial of a Roller Mill. (41st Report of the Machine Testing Station of the Chamber of Agriculture for the Province of Brandenburg). — FISCHER, G. in *Mitteilungen des Verbandes landwirtschaftl. Maschinen Prüfungs-Anstalten*, Year 7, Part 4, pp. 153-161. Berlin, 1913.

The machine was submitted to a series of tests on April 23 at the Agri ural College in Berlin and then entrusted to the Hobrechtsfeld farm in neighbourhood of Berlin and belonging to it, for the trial of resistance. The writer gives a detailed description of the machine and of its work-

A cast iron support bears the hopper and the feeding device (see fig. The milling rollers are enclosed in a cast iron case resting on a strong e. Fig. 2 shows a section through the mill.

Its price is about £42 10 *s.*

A report of the trial is given and the data obtained are grouped in the wing table.

Date	Grain ground	Duration of trial		Performance	Power required	Number of revolutions per minute	Degree of fineness of product	Kind of groats	Performance per hour	Performance per HP.-hour
		Min.	Secs.	lbs.			$>3:>2:>1:<1$ mm.		lbs.	lbs.
23.4.13	Barley	4	56	202	10.87	408	3:8:68:21	medium	2462	227
»	»	2	25	173	10.50	423	8:25:54:13	»	4290	409
»	Ma ze	5	11	389	11.35	411	—	—	4497	396
»	Rye	1	50	183	11.52	417	4:44.5:37.5:14	coarse	5997	521
23.6.13	»	49	40	4565	11.00	419	19.5:39.5:29.5:11.5	»	5386	491
»	Barley	46	30	3496	11.75	415	15:32:40:13	medium	4510	385
»	»	2	50	117	10.90	416	4.5:7.5:36:52	fine	2468	226
20.9.13	Rye	50	30	5392	13.05	420	11.5:41.5:34.5:12.5	coarse	6406	493
»	Barley	30	00	2424	11.70	420	20:34:35:11	medium	4849	414
»	Maize	9	00	1485	8.85	421	75:15:7.5:2.5	crushed	9900	1118
»	»	4	35	234	12.35	419	0.5:9:61.5:29	medium	3067	249

The final judgment on the mill was as follows: It is simple and tably constructed in all its parts, and is easy and safe to handle. The put is considerable and the amount of power it requires, considering output and its degree of fineness, is very low. The mill is suitable for

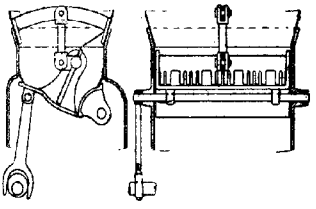


Fig. 1. — Hopper and feeding device.

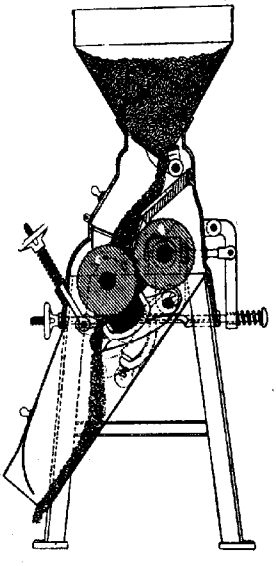


Fig. 2. — Section of roller-mill.

production of groats of the degree of fineness most required in practice, a the product is good and cool. The feeding device and the case round t rollers are remarkable and practically important innovations in t construction of agricultural mills. The durability of the mill, according the trial of resistance, is great.

Review of Patents.

Tillage implements and machines.

26 (Germany). Turn-wrest plough with shares that can turn round the beam.
27 (Germany). Motor tilling machine with hydraulic lifter for the tilling implements.
52 (Germany). Motor power plough with driving wheels driven by differential gear, and fitted with special steering wheel.
1 (Austria). Motor plough consisting of hauling motor and plough chariot.
4 (Austria). Portable cultivator with implement shaft driven by motor and placed behind the driving wheels.
2 (Austria). Motor plough.
7 (Hungary). Soil tilling machine with implements mounted on a drum.
4 (Hungary). Turn-wrest plough.
2 (Hungary). Motor plough.
92 (Belgium). Motor plough.
32 (Belgium). Turn-wrest plough.
32 (Belgium). Traction engine for ploughs and other agricultural implements.
752 (United States). Plough.
410 (United States). Disk-cultivator.
520 (United States). Combined plough and harrow.
39 (France). Machine for tilling the soil.
02 (France). Improvement in ploughs driven by motor.
11 (France). Harrow with rotating teeth.
United Kingdom). Motor-driven cultivator.
4 (United Kingdom). Plough.
(United Kingdom). Oscillating plough.
82 (Italy). Improvements in soil tilling implements hauled by cables.
16 (Italy). Ploughing machine.

RURAL ECONOMICS.

RURAL ECONOMICS

Some Profitable and Unprofitable Farms in New Hampshire. — ROBERTSON, FRED. E. and DODGE, LAWRENCE G. in *U. S. Department of Agriculture, Bureau of Plant Industry, Circular* No. 123, pp. 3-15. Washington, May 24, 1913.

The New Hampshire College Agricultural Experiment Station, together with the Bureau of Plant Industry, U. S. Department of Agriculture, investigated the working and profitableness of 428 farms in the State of New Hampshire. The results of these investigations are given and discussed by the writers in this paper. They compare the averages of the group of 100 profitable farms with those of 100 of the least profitable ones, and from the comparison draw conclusions as to the causes of the great difference in economic success, as is shown by the following table:

	100 better farms	100 poorer farms	Average of farms
	$	$	$
Receipts	2 318	991	1 439
Expenses	1 083	792	796
Net income	1 235	139	643
Interest on investment, 5 %	360	348	368
Family labour	53	130	70
Labour income	830	— 341	265

The average areas of all the 428 farms of which data were obtai are the following:

	100 better farms	100 poorer farms	Average of farms
	acres	acres	acres
Tillable	50	44	43.2
Pasture	130	100	99.8
Woodland	23	29	30.5
Total	203	182	173.5

The difference in acreage is slight; the group of better farms has average of only 21 acres more land per farm than the poorer group only 6 acres more of tillable land. When it is considered that the lab income of the farmers on the better farms averages $830 and that th farmers on the poorer farms have a minus labour income averaging $ the small difference in acreage does not seem to offer an adequate exp nation for the great difference in income.

When these same 200 farms are redivided on the basis of till acreage, the 100 having the largest tillable acreage have an average lab income of $341, while the 100 with the smallest tillable acreage have average of $190. This would indicate that acreage is certainly one fac that counts in determining the labour income, though not enough explain the above-mentioned great difference.

The writers then compare the distribution of capital in the two groups:

	100 better farms	100 poorer farms	Average: 428 farms
	$	$	$
nery and tools	453	351	352
estate	4 864	5 332	4 404
stock	1 592	1 045	1 152
and feed	145	106	106
to run business	163	144	137
Total . . .	7 217	6 978	6 151

The difference of $239 per farm is so small as to offer no reason for great difference of earning power between the two groups.

A marked difference exists, however, between the two groups in the bution of the capital. The better farms have 32.6 per cent. of their capital as working capital and the poorer have only 23.5 per cent. ich. This unfavourable condition is often due to having relatively much capital in buildings.

The receipts from the better farms exceed those of the poorer by 149 ent., as is shown by the following table:

	100 better farms	100 poorer farms	Average: 428 farms
	$	$	$
sales	347	136	262
ve stock sales	260	121	162
f stock products	1 389	612	814
sed inventory	184	30	110
le labour	138	32	91
Total receipts . . .	2 318	931	1 439

The greater success of the farmers belonging to the first group is not ed by an absolute saving of expenses, because their average expenses

are $291 or 36.7 per cent. greater than on the poorer farms, as the lowing table shows:

	100 better farms	100 poorer farms	Average farms
	$	$	$
Hire of labour	250	181	173
Board of labour	76	74	
Seeds	21	14	
Fertilizers	64	37	
Hay	17	11	
Feed and grains	398	258	
Machinery	45	22	
Buildings and repairs	46	40	
Silo filling	11	6	
Horse-shoeing	24	20	
Milk hauling	11	11	
Taxes	73	78	
Other expenses	38	40	
Total	1 083	792	79

The success of the better farmers is due to more and better crops more productive herds, which in their turn are due to a more effe use of land and time.

The writers also give tables comparing the conditions and income two characteristic farms of the first group and one of the second, wh lead to the same conclusions.

61 – **The Private Economic Conditions of Moravian Peasant Farmers** Communication of the Book-keeping and Farming Department of the German tion of the Moravian Agricultural Council, in *Zentralblatt für Landwirtschaft*, Year No. 22, pp. 253-255. Brünn, November 16, 1913.

The data obtained from 79 Moravian peasant farms show that, with considering debts or other burthens, the average income per acre £2 15*s* 8*d*, of which £2 7*s* 7*d* (85.4 per cent.) is derived from the fa itself, 2*s* (3.7 per cent.) from accessory industries, and 6*s* 1*d* (10.9 per ce from other sources. The average extent of the farms being 73.66 ac the average yearly income of the 79 farms is the following:

	Group	Average extent of farm: acres	Altogether				Per acre				In percentages			
			from farm itself	from accessory industries	from other sources	Total	from farm itself	from accessory industries	from other sources	Total	from farm itself	from accessory industries	from other sources	Total
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	s. d.	£ s. d.				
Influence of natural conditions	I	71.79	221 11 1	13 6 9	70 7 10	305 5 8	3 1 9	3 8	18 3	4 3 8	73.8	4.4	21.8	100
	II	75.57	164 8 4	3 5 10	15 5 11	183 0 1	2 3 6	1 0	4 0	2 8 6	89.5	2.0	8.5	100
	III	70.06	164 4 2	13 0 1	7 1 8	184 5 11	2 6 11	3 8	2 0	2 12 7	89.2	7.0	3.8	100
Influence of economic conditions	I	48.80	84 15 5	12 6 9	6 11 9	103 13 11	1 14 9	5 1	2 8	2 2 6	81.7	11.9	6.4	100
	II	81.27	163 2 6	16 9 3	13 0 11	192 12 8	2 0 2	4 0	2 8	2 6 10	85.7	8.6	5.7	100
	III	58.44	158 14 2	1 19 2	25 12 6	186 5 10	2 14 4	0 8	8 9	3 3 9	85.1	1.1	13.8	100
	IV	96.45	172 5 0	3 5 0	17 17 7	193 7 7	2 13 8	0 8	3 8	2 18 0	92.4	1.1	6.5	100
Influence of extent of farm	I	223.88	336 0 10	3 15 10	15 1 9	354 18 5	1 10 0	0 4	1 4	1 11 8	94.6	1.0	4.4	100
	II	108.11	240 13 8	14 11 9	25 11 0	280 16 5	2 4 6	2 8	4 9	2 11 11	85.7	5.1	9.2	100
	III	69.76	139 19 10	1 3 4	20 0 1	161 3 3	2 0 2	0 4	5 9	2 6 3	86.8	0.7	12.5	100
	IV	49.05	154 14 1	6 12 6	26 9 4	187 15 11	3 3 1	2 8	10 9	3 16 6	82.3	3.5	14.2	100
	V	25.49	56 7 9	4 15 10	5 5 0	66 8 7	2 3 6	3 8	4 0	2 11 2	84.8	7.2	18.0	100

	£	s	d
Income from the farm itself	175	3	6
Income from accessory industries	7	9	1
Income from other sources	22	7	3
Total	204	19	10

The amount of the income from the farm itself diminishes as natural and economic situations become less favourable, as well as with decrease of acreage. The proportion of the income of the farm itself to total income becomes greater the more unfavourable the natural position the farm and the more favourable its economic situation; it becomes sm ler the smaller the farm, for as the latter does not afford the own sufficient income, he is obliged to have recourse to other sources to out his means of living. It appears however from the annexed table: " comes of debt-free properties," that the principal occupation of the own of all the farms examined is agricultural, for in all the groups the come from the farming proper is by far the largest item of the total inco so that all the other sources of revenue are to be considered as auxiliary

The average net income from the farm (£2 7s 7d per acre) bears, on average of the 79 farms, a burthen of 6s 1d (12.7 per cent.) interest on de and 4s 0½d (8.5 per cent.) servitudes in kind, together 10s 1 ½d (or 2 per cent.). Only 16 out of the 79 farms (or 20.2 per cent.) are free fr debts and only 39 (or 49.3 per cent.) are free from servitudes in kind

The amount of the debts is not influenced by the natural and econo conditions of production, though on going from the plains towards the mo tains a decrease of the amount of servitudes is noticeable. The same observed with the improvement of economic situation.

The average net income of £2 7s 7d, together with £3 2s 6d a month remuneration for the farmer's labour, works out at an interest of 1.89 cent. on the capital. The average indebtedness of the 79 farms amount £6.9s 2d per acre (on a land value of £34 4s 1d per acre). The interest on farming debts is about 4.7 per cent ; compared with the interest on the tal, namely 1.89 per cent., this is a high rate of interest and diminis the farmer's share of the net profit to a a considerable extent. From calculation of averages it appears that the rate of interest (1.89 per c on debt-free farms is reduced to 1.33 per cent. by the servitudes, to 1.7 cent. by debts and to 0.5 per cent. by both together.

62 - **Farming Conditions in the Department of Puy-de-Dôme, France.** — LARMÉ, MICHEL in *La Vie agricole et rurale*, Year 4, No. 46, pp. 497-501, October 1913.

Division of the country into agricultural belts according to altitude a sea-level ; acreage devoted to the principal crops ; characteristic of the culture of the regions in the extension of forage crops: with less than 49 acres under cereals there are upwards of 741 000 acres of forage c The increase of acreage and of yield per unit of area of the most exac cereals (wheat, oats and barley) are evidence of progress in far

: 1892. From that year to 1911 the area under vineyards sank from 274 to 57 601 acres, whilst the area devoted to field forage-plants from 135 910 acres to 148 265, and that under meadows and pastures 1 452 210 acres to 625 180. Fruit-growing and market gardening are dily extending.

The number of horses rose from 15 500 in 1892 to 18 500 in 1911, that of :s from 499 to 830 and that of asses from 3805 to 6300, while the number ieep fell by about 100 000 head. The breeding of cattle has developed tly. In the mountains dairying (butter and cheese making) prevails, e on the plateaus and in the valleys cattle are more used as draught ials, the cows also being harnessed.

The subdivision of land has been carried far and represents one of the test obstacles to the further introduction of improved methods of farm- small farms (under 25 acres) are prevalent and the fields composing n are frequently at a distance from each other. The land is mostly ied by the owners themselves; it is seldom rented and only exception- worked on the share system. Only by a greater development of ieration and by untiring agricultural education in the country will ning be able to make further progress under existing conditions.

The Profitableness of Milk Farms. (1). — AUF DEM THIE, HERMANN in *Archiv für exakte Wirtschaftsforschung*, Supplement 11, pp. 1-99. Jena, 1911.

The author seeks to establish the individual factors of the profits made nilk farms under various conditions, availing himself of the data obtained book-keeping, partly taken directly, partly from the literature on the ject. After some preliminary observations on the conflicting opinions id in the above literature on the profitableness and the importance to lic economy of this system of keeping milch cattle, the writer discusses methods for ascertaining the profitableness of a branch of farming in ral, and of keeping milch-cattle in particular, the calculation of the of milk production, and the determination of the utilization of the ge used. He then investigates, with the aid of tables, which contain the vidual results of his calculations, the effect of the several factors upon the its of milk farms.

The fodder consumed by individual animals and by various herds is zed by them very variously as regards both the production of milk the increase of live weight; as the better performance, in so far as it nds upon the nature of the animals, is, under certain conditions, avail- free of expense, the increase in the capacity of producing is an import- factor of profit; on the other hand, the high price that is paid for highly luctive animals often counterbalances the advantages of a good utili- on of fodder.

The loss on selling cows may be distributed over a longer period by feed- to keep up the milk yield when the cow would naturally be drying off;

(1) German « Abmelkbetrieb », *i. e.* when the cows are bought in, milked once, and off again. (*Ed.*).

but if the cost of the extra concentrated food exceeds the value of the ex milk obtained, the utilization value of the home-grown produce w be reduced, and to an extent varying with the proportion of purchased fo fed and the difference between its price and utilization value. When t purchase price is above the utilization value, the number of cows must d pend on the amount of forage produced on the farm. If, however, the uti zation value is greater than the purchase price, milk production may pr fitably become a purely industrial undertaking depending entirely on pu chased food.

The amount of the milk yield in exclusive milk farms has a generally the decisive influence upon the profitableness that it has other dairy farms. With the yield of milk, expenses increase also, es cially those for concentrated foods, while the cost of labour and gene expenses are not influenced to any great extent. Increased expenditu with the object of attaining a high milk yield is all the more justified the high the price of milk, because the great influence which this has on the pro of the milk farm is felt increasingly with augmenting milk yield. The pr fit realized upon the milk depends upon the economic position of the far and the consequent manner of utilizing the milk. The best utilizati of milk is by direct disposal to private customers; no doubt the expen entailed by selling the milk in this way are often high enough, but they not reach the trade profit of the milk merchant and the expenses of the d ries that collect milk from the producers. Selling the milk to dairies th make butter, and working up the milk in the farm itself, are in general t least profitable ways of utilizing milk.

The general expenses and those for labour and teams make up a gre part of the total outlay and weigh all the heavier the lower the price of t milk and the lower the milk yield, as they do not depend upon these f tors.

The average cost of labour per cow per annum is about £3, the gene expenses about £1 10*s*, while the expenses for team work, which are low vary considerably according to the economic position of the farm. Of s cial importance for the profitableness of the keeping of milch cows is the wo of the stable hands. By improper feeding, bad milking and careless tre ment, many losses may be incurred. The wages must be so arranged t the profits of the attendants coincide with the interest of their employ (rewards on a sliding scale).

The difference between the buying-in price and selling-off price of cows has also a great influence on the profit of milk farms. It determi the extent and the character of the milk farm. If the buying-in price of unit of weight is lower than the selling-off price, the quickest turning o of the capital in cows is, from the point of view of private economy, most profitable. But there are few farms which realize such a profit on animals; most farms must put up with a loss of live-weight, which is quently considerable. In one of the farms examined, this loss amoun to £8 6*s* per cow per annum. As a consequence, the present tendency towards keeping the cows longer and allowing the best to calve again in

ı (Halbabmelkbetrieb). By their staying longer, the loss in live-weight read over a longer period and partly balanced by the sale of the calves. feeding, also, is less intensive in these farms, many of the more expensive s being saved. The consequent diminution of expenses is not, in t cases, set off by a smaller quantity of milk being sold. In this sys- also, the injury caused by the exclusive milk-farms to public eco- y, by selling milch-cows prematurely to the butcher, is not so great, frequently the best calves get sold to breeders instead of to the butchers. The question whether exclusive milk-farming is economically the best of keeping milch-cows, and how the farms are to be arranged and man- l in order to yield the greatest profit, cannot be answered without ful examination of all the factors contributing to the net profit, ralizations of only a few figures being often misleading.

AGRICULTURAL INDUSTRIES.

DAIRYING.

- Summary of the Results of Researches made during the Last Few Years it the Dairy Institute at Alnarp (Sweden), by L. F. Rosengren. — *Communication y the Official Correspondent of Sweden to the International Institute of Agriculture.*

I. *Fat content of skimmed whey.*—If whey is submitted to a violent motion, as, for instance, working in a churn for 30 minutes at a temperature ° C. (122° F.), the cream cannot afterwards be separated to the same ee as if it had not been so treated. Thus the writer found that whey con- ng 0.305 per cent. of fat was reduced by separating without previous ning to a fat content of 0.035 per cent., whilst when churned before rating it was reduced to only 0.235 per cent. This result agrees with obtained in M. Barthel's experiments on separating (*Revue générale it, III*, p. 25).

Whilst the determination of the fat content according to Röse-Gottlieb's od gives higher results than when Adams' method is followed, the ference becomes still greater if the milk has been worked before skim- . M. Barthel has shown that this difference does not appear on examin- he whey. This fact confirms the hypothesis of M. Weibull that in g the milk according to Adamas' method, the smallest globules of fat nclosed in the casein, so that they are inaccessible to dissolution in (*Lantbruksakademiens Handlingar och Tidskrift*, 1898, p. 3).

This higher fat content obtained by Röse-Gottlieb's method, cannot, ie other hand, result from the dissolution of gelatinous membranes in ther and benzine mixture, as M. Storh supposed (36 *Beretning frå 'et. og Lundbohöisk. Lab. f. Landoekön. Forsog*, 1897, p. 87), since the tity of matter not fat dissolved by the above mixture is too insignificant able to exert any notable influence on the results of the analysis, and es it does not consist of gelatinous membranes, but of lecithin or of ucts of its decomposition. (ROSENGREN, L. F. « Gottlieb ou Adams » *evue générale du lait* III, 1904).

2. *The fat content of skimmed milk in connection with the progress lactation.* — The writer has demonstrated that there is a considerable diff ence in the degree to which milk is capable of separation at the differ periods of lactation. Accordingly as the milk came from cows near the e of the lactation or from cows that had recently calved or was a mixture these two kinds of milk, it contained the following amounts of fat:

Temperature of separating	Milk of cows drying off	Milk of cows recently calved	Mixed milk
	per cent.	per cent.	per cent.
30° C (86° F.)	0.235	0.12	0.18
40° C (104° F.)	0.196	0.11	0.17
60° C (140° F.)	0.145	0.098	0.12

(ROSENGREN, L. F. *Tidskrift för Landtmän*, 1903, p. 209.)

3. *Value of Weibull's method for the determination of the fat conten cream.* — Weibull's method, according to which the fat content is de mined on the dried cream, may be advantageously employed in dairies w the aid of the balances used to determine the amount of water present butter. Provided it is certain that the cream has not been watered, method, which is rapid and sure, lends itself especially to the contro the fat content of cream sold directly from the dairy. (ROSENGREN, L. *Landtbr. Akademiens Handl. och Tidskr.*, 1910, p. 73).

4. *The ordinary method for determining the amount of impurities* the milk is probably weighing the sediment obtained by various me from a certain quantity of milk. Considering that in this sediment ther a fairly considerable quantity of the undissolved salts of the milk, the ures representing the impurities are too high, if the sediment before be dried and weighed has not been treated, for instance, by a weak s tion of hydrochloric acid. (ROSENGREN, Ulanderska mjölkrenaren.—*Ma lande* No. 8 *från Maskin och Redskapsprofningarna*).

5. *Ripening of the cream at low temperatures.*— In 1899 the so-called mentation at a low temperature, about 10-12° C. (50 to 54° F.) was introdu into the Alnarp dairy and then gradually into most of the Swedish dairie the cream has been pasteurized and then cooled to this point, its temp ture will rise again by some degrees during ripening, independently of surrounding temperature, so that it becomes suitable for churning.

By this method of ripening, a saving of labour and of refrigerato effected in comparison with ordinary ripening at a higher temperature, w necessitates a cooling of the cream before churning. At the same time danger of carrying acidification too far is avoided. The lactic ferm employed for the ripening of cream develop at a temperature as low as 19° C. (48 to 50° F.), and fast enough to allow cream to which 5 to 10 cent. of ferment has been added and which has been stirred from time time during the first hours, to be ready for churning within 18 or 20 h (ROSENGREN, L. F. *Berättelse öfver Svenska Smörprofningarna år* 1900

6. *Keeping the lactic ferment.* — Among the most effective measur keep a culture of lactic ferment which will be employed for ripening cr

very frequent stirring of the culture after transplanting it into some teurized skimmed milk must especially be mentioned, as it renders the elopment of the lactic acid bacteria more active and forms the best ence against injurious micro-organisms. When the conditions favourable the development of the ferment have ceased or the milk has curdled, culture of the ferment must be considerably cooled. (ROSENGREEN, L. F. *ättelse öfver Svenska Smörprofningarna*, 1898).

7. *Influence of a too acid ferment on the butter.* — A very common de- of butter, which depreciates it greatly, is the taste of malt. In examining conditions under which this taste appears, the writer has found that s caused by the prevalence of the lactobacilli over the streptococci in ferment used to ripen the cream. His researches have demonstrated t the development of the lactobacilli is promoted by the strong acidi- tion of the milk, which does not suit the streptococci. If the ferment llowed to become too acid several times before it is sown into the pasteur- l milk, the lactobacilli predominate more and more over the strepto- ci and are besides generally accompanied by yeasts. The use of such a ated ferment to start the ripening of the cream causes, according to the earches of the writer, the above-mentioned defect in the butter. (ROSEN- EN, L. F. in *Landtbr. Akademiens Handl. och Tidskr.*, 1911, p. 596).

8. *The water content of butter* depends, according to the writer's investi- ions, upon the following circumstances:

a) The content in water increases as the working up becomes more rgetic; the greater the speed of the roller of the butter-worker the more tinuous the work and the more the butter passes between the rollers large lumps. It diminishes if the butter is worked in small masses and n interruption of the work allows the brine to escape.

b) The water content diminishes, the firmer the butter when it is rked up.

c) The degree of moisture in the butter when placed on the worker; the her this is the more water will the butter contain.

d) The adhesiveness of the liquid in the worked butter increases its ention by the butter; consequently an unwashed or a badly washed tter will contain more water than a well washed one.

e) Acid butter retains more water than a butter churned from sweet am.

f) The addition of salt favours the draining of the water.

g) The draining off of the liquid is easier the larger the granules of ter, a butter consisting of small granules retaining water like a sponge. SENGREN, L. F. *Berättelse öfver Svenska Smörprofningarna*, 1902, 1907).

9. *Influence of various kinds of concentrated foods on the butter.* — Soya e has been used in amounts reaching 5 ½ lbs. per head per day without ununicatng any special taste to the butter or in any way lowering its lity. (ROSENGREN, L. F. *Landtbruksakademiens Handl. och Tidskr.*).

Sesame cake has proved equal to earthnut cake as regards its influence butter. (ROSENGREN, L. F. *Landtbruksakad. Handl. och Tidskr.*).

Peas, beans and vetches, of which as much as 8 3/4 lbs. per head per d have been included in a normal feeding ration, have not had any injuriou action on the quality of the butter; they may in this respect be put on the sa level as ordinary feeding cakes. Thus the experiments made have given support to the wide-spread opinion that pulse imparts to the butter inferior taste. (ROSENGREN, L. F. *Landtbruksakad. Handl. och Tidsk* 1912, p. 592).

10. *Refrigeration of butter.* — In order to keep the butter good for weekly exportations refrigerating safes are used for storing the barre The writer has made some experiments on the cunsumption of ice and changes of temperature in such a safe built with double wooden walls abo 3 inches apart and containing 300 to 350 lbs. of ice and holding four barr of butter. He caused it to be filled with ice the first day and did not ha any more ice added during the seven days that the experiment lash During this time the average temperature kept at 6.3° C. (43.3° F.), varyi from 6° to 6.9° C. (42.8° to 44.4° F.), the outer temperature being 21.2 (70.2° F.). The consumption of ice was 0.16 kg. per cubic metre and per gree of difference between the inner and the outer temperatures (0.005 of ice per cubic foot per 1° F.).

When the insulating material (well rammed chaff), was removed, le ing only air insulation, the consumption of ice rose to 0.30 kg., that to say almost double.

When the ice was mixed with 5 per cent. of salt, the inside temperat of the safe sank to below freezing point.

The temperature of the butter in the barrels sank from 16° C. (60.8° F 14.5° C. (58.1° F.) the first day, to 11.6° C (52.9° F.) the second, to 10.6 (51.1° F.) the third, and to 10.3° C. (50.5° F.) the fourth day, the temp ture in the inside of the safe being in this case 7.3° C. (45.1° F.) (Ros GREN, L. F. *Berättelse öfver Svenska Smörprofningarna,* 1905).

11. *Control of the purity of the water used for washing the butte regard to salts of iron.* — In order to avoid the injurious influence the salts of iron on the quality of the butter, the water used for wash it must not reveal the presence of iron when tested with potassium phocyanate. The examination is made, according to the writer, as follo 20c. c. of water are boiled in a test-tube after the addition of a few drop bromine water; a few drops of hydrochloric acid and 1 to 2c. c. of a solu of potassium sulphocyanate are then added, the mixture is shaken and mi with 5c. c. of ether and again shaken. The ether, on separating out from aqueous solution, must not be sensibly coloured by the iron sulphocyan (ROSENGREN, L. F. *Berättelse från Alnarps Landtbruks-och Mejeriinstitut,* 1

12. *Use of cultures of lactic ferments in cheese making.* — Since 1899 tures of lactic ferments have been used in the Alnarp dairy for the pr ration of various kinds of cheeses. These cultures consist of the com lactic ferment, *Streptococcus lacticus*. The intense feeding of the c leading to the production of a milk less suitable for cheese-making rendered the use of cultures of lactic ferments absolutely necessary for successful manufacture of cheeses of a uniform character.

Cultures of lactic ferments are employed with good results in a great ber of Swedish dairies. In 1902 experiments were begun with the llus Σ Freudenreich, and they have confirmed the opinion of v. Freuden- ı and d'Orla Jensen on the importance of these organisms for the manu- ıre of cheeses of the Emmenthal type.

13. *Coating cheeses with paraffin.* — Since 1905 all kinds of hard cheeses e at the Alnarp dairy have been coated with paraffin. Experience shown the utility of this treatment, the success of which, however, ınds upon various circumstances. The temperature of the paraffin bath which the cheeses are plunged must not be inferior to 130° C. (266° F.) the cheese must be well cleaned, dry and not acid, because acidity s generally to the exudation of moisture which detaches the paraffin coat. The coating must be renewed as soon as the previous coat cracks or otherwise spoiled.

It may be estimated that the usual loss of weight during storage is inished by about 10 per cent. by this treatment. The quality of the se is improved and the deterioration of cheese due to mites and moulds voided; at the same time the work of handling the cheese in the store e is lightened.

Determination of the Amount of Water added to Milk based on the Degree of Acidity. — Gerő, Vilmos in *Kisérletügyi Közlemények*, Year XVI, Part 5, pp. 663-664. Budapest, September-October 1913.

Among the available means for determining the amount of watering hich milk has been subjected, the specific gravity of the serum and the action are undoubtedly the most trustworthy. The other analytical ors should correspond, but they are often liable to oscillations. It is impossible to found a sure judgment on the ash content, especially when milk has been adulterated with well-water containing much mineral ter.

In order to determine the degree of freshness of the milk, especially in mer, the writer has determined its acidity by Thörner's method; he erved that the acidity of watered milk is much below that of pure . In Hungary the amount of acidity of the milk on sale varies veen 17 and 22°, whilst milk adulterated with water shows less than 15°, when much water has been added, the acidity sinks to 13, 12 and 1 10°.

In support of the above, the writer shows in the following table the lts of some analyses of milks made in the year 1909, which was a year hich adulteration was frequent.

Of course, the degree of acidity, like the other factors, has not an ab- lte value and it may happen sometimes that watered milk marks 15° even more, while fresh milk submitted immediately to analysis marks e degree below normal (15°). Nevertheless this has never been observed n the samples were taken on the market.

In summer, when the process of acidification is more rapid, it might believed that the acidity of adulterated milk would be high; whereas eality such is not the case, because the acidification of adulterated milk

Number	Specific gravity	Fat	Total solids	S. G. of serum	Nitrate reaction	Degree of acidity
4	1.0252	4.4	11.83	1.0208	strong	10.
8	1.0270	3.1	10.72	1.0226	strong	12.
21	1.0240	2.8	9.60	1.0205	strong	10.
22	1.0219	2.65	8.71	1.0190	weak	9.
35	1.0240	3.7	10.68	1.0190	strong	10.

is slow. This same fact is also been observed in the preparation of curd milk: normal or skimmed milk curdles rapidly, whilst the coagulation watered milk lasts twice or thrice as long. The result of all these ob vations is that if the degree of acidity is minimal and it agrees with other data it may serve as a basis for the valuation of the milk.

66 – **The Relationship between the Bacterial Flora of Milk and of the Past** — WOLFF, A. in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankhe* Vol. 39, No. 15-17, pp. 411-419. Jena, November 29, 1913.

The writer has made a comparative bacteriological investigation the pasture grass and the milk of cows grazing upon the latter, and been able to establish a fairly close connection between the flora of milk and that of the grazing ground. In addition to those bacteria (C *aerogenes* group) which occur regularly in the milk and on the pasture al there are other specific pasture bacteria only to be found in the milk dur the grazing season. As such may be mentioned *Bacterium trifolii, fulv herbicola Burri, lactorubefaciens*, and the short rod-like form inhabiting common daisy. The similarity between the flora of the pasture and tha the milk depends largely upon the handling of the milk and of the udder is usually greatest when such treatment is least good.

There is much less similarity between the flora of the milk and fod of stall-fed cows than exists between the bacteria present in the pasture the milk of grazing animals. This is chiefly to be attributed to the fact t the fodder comes less in contact with the udder in the stall than does grass in the pasture. A closer relationship exists, in the case of stall cows, between the milk and litter floras than between those of the u and the fodder.

The Composition of Ewes' Milk Sold in Hungary (1). — BIRÓ, GUSZTÁV in *Iserlatügyi Közlemények*, Year XVI, No. 5, pp. 656-662. Budapest, Sept.-Oct. 1913.

Considering that in the great plain of Hungary, besides cows' milk, milk is also a staple article of trade, the Municipal Laboratory gricultural chemistry of Kecskemet has undertaken the systematic sis of the ewes' milk sold, in order to become acquainted with the oximate composition of whole ewes' milk. The greatest number of les for analysis were taken without any selection at the local market from ixed milk of the producers and of the retailers, whilst a very small tity was taken when the control of milk was carried out. The most of these control samples were compared with those taken in the sheep- the latter generally containing a little more fat than the control les. This difference was however very small (0.4 to 0.8 per cent.) and y be attributed partly to the ordinary variations in the composition of and partly to the handling.

The following table shows the average composition of the whole ewes' sold on the Kecskemet market between April and August, and the me values of a series of analyses:

	S. G. of milk — 15° C.	S. G. of solids	S. G. of whey — 15° C.	Total solids	Fat	Total solids not fat	Ash	Fat content of total solids
e.	1.0361	1.2210	1.0330	19.70	7.87	11.85	0.75	39.79
im	1.0326	1.1597	1.0302	17.09	5.65	9.48	0.68	27.07
im.	1.0406	1.2649	1.0355	22 98	10.45	13.82	0.88	54.30

Complete Churning and Questions Connected with it. — ROSENGREN, L. F. *K. Landtbruksakademiens Handlingar och Tidskrift*, Year 1913, No. 4, pp. 254-275. ckholm, 1913.

The writer shows that the completeness with which the fat contained k passes into the butter cannot be ascertained with certainty by the ntent of the buttermilk, nor by the quantity of fat contained in the natter of the buttermilk, because both vary considerably according fat content of the cream and to the quantity of cream that has been from the milk. Thus the absolute quantity of fat remaining in the milk derived from 100 lbs. of milk is the only evidence of the degree rning which can be trusted. In Sweden it is considered that 1 oz. in 125 lbs. of milk is the highest figure which should be found after satisfy churning.

(1) See No. 585, *B.* May 1913. (*Ed.*).

The writer mentions several ways of calculating the percentage cream obtained by skimming and the quantity of fat that remains in buttermilk, and gives tables of the quantities obtained under differe conditions.

Among the factors which influence the amount of butter made (Ausb terungsgrad), the temperature at which churning is done is the most imp tant. Too high a temperature is usually the cause of cream being completely transformed into butter; it is especially so since the adoption the combined churn and butter-worker, which allows churning at a relati high temperature without any inconvenience to the quality of the but and the manner of treating it.

It has been proved by experiments that churning at a temperatur 15° C. (59° F.) yielded 0.78 parts of fat in the butter-milk from 100 part milk, against 0.40 parts found after churning at 11° C. (51.8° F.), that 4 ½ lbs. of butter in 100 gallons of milk.

Nevertheless, 11° C. (51.8 °F.) is not always the most favourable te perature for complete churning. Only a careful control of churning every particular case will reveal the most suitable temperature. In gen this temperature must be lower, the less the cream has been cooled bef ripening, the higher the temperature of ripening, and the more the fat, ow to its chemical composition, lacks cohesion.

Even in those cases in which cream ripens at a temperature as low 10 to 13° C. (50 to 55.4° F.) the temperature rises to such a degree dur the process of ripening, especially in hot weather, that it is necessary view of complete churning to cool the cream before straining it into the ch

If the temperature of the cream has to be lowered by only 2 to 4 (3.6 to 7.2° F.), direct cooling by means of ice is the most suitable. Ab 20 lbs. of ice are required to cool 500 lbs. of cream at 57° down to 52 Of course the ice used for this purpose must be made with pure wa free from germs, preferably pasteurized water; this must also be with chemical impurities, especially salts of iron. In cases in which no machine is availabe, the best and cheapest way to make artificial ice is placing a pan filled with water in a mixture of 100 parts of natural 10 parts of coarse salt and 30 parts of water. The writer describes a sim apparatus for making ice in this way, by means of which he has obta 66 lbs. of artificial ice by using 100 lbs. of natural ice.

Experiments have shown that the quantity of fat remaining in buttermilk during churning was the same whether the cooling was perfor by an ice bath or by ice being placed in the cream.

In order to obtain complete churning, some dairies, instead of coo the cream, skim the buttermilk; by this method the amount of fat rem ng in the buttermilk has been diminished from 0.79 to 0.46 per cent. skimming has to be carried out at a low temperature, in order to avoid coagulation of the buttermilk, which would reduce the separation of th to one-half or one-third of what couold be obtained by the usual mac separating. Besides, the salts of iron give the butter a bitter taste. Mi

cream skimmed off from the buttermilk with normal cream, as is comıly done, results in imparting a metallic taste to all the butter.

The fat content of the cream is also important for the completeness of churning. Very poor and very rich creams are less completely churned n average ones.

It is supposed that if pasteurized cream allows of less complete churning n another cream, it is due to the amount of work to which it has been mitted, especially in the pasteurisers, which cause the cream to rise and ose stirrers revolve at a very high speed. This observation has been conıed by experiment, for the greater the quantity of cream that could be ıted by the pasteurizer in a given time, the more complete was the rning; on the other hand the speed of the stirrers had no effect ıtever.

The extent to which the churn is filled also exerts an influence, at least in rotary churns (barrel churns). The churning was less complete when churn was less full, especially when the cream had a high fat content.

The writer lastly points out that among the large mechanical churns, the nish churn and the modern combined churn and butter-worker also give ood complete churning; nevertheless, the former requires more scrupulous e in the handling than the latter. On the other hand the combined churn l butter-worker, when it is not quite full and when the cream is very rich, y give a less complete churning owing to the fact that it is more difficult to ırn completely the cream which adheres to the projecting blades, to the e, etc. This difficulty is overcome if towards the end of the operation the ırn is given a few turns in the contrary direction; the washing is then re complete and the churning becomes satisfactory.

– **Promoting the Formation of Eyes in Emmental Cheeses.** – STEINEGGER in *Schweizerische Milchzeitung*, Year 39, No. 88, p. 1. Schaffhausen, November 4, 1913.

The writer recommends, on the basis of practical experiments, the adion of casolin to the rennet as a means of obtaining Emmental cheeses ll and uniformly provided with eyes and able to stand storage. Casolin found in trade; it is a mixture of acids which has no injurious effect the taste and fineness of the cheese, or on the process of making it. Cheeses de with casolin begin to ferment in the warm cellar eight or ten days ner than the others, and consequently the formation of the eyes begins ner; it proceeds steadily and normally; after-fermentations in the lar do not set in.

The rennet is prepared as follows: the stomach is placed in a suitable ssel and 300 c.c. of whey at 30° C. (86° F.) are poured over it; 2 to 4 c. c. (ac rding to the eye formation desired) of casolin are then added and the mixre is stirred and kept for three hours at 30° C., shaking it every now and en. Then the usual amount of whey at 30° C. is added and the rennet is pt at the temperature required by circumstances. The rennet thus prered is of perfect composition; it does not present floating pieces of mach, nor has it any bad smell or taste. It possesses mostly an acidity

of 30 degrees, and when the casolin has been aded in a proper quantity it never causes swelling or ropiness of the cheese. Casolin keeps good a long time.

70 – **The Use of Hydrosulphites in the Manufacture of Beet Sugar.** — MARCUS in *Journal des Fabricants de Sucre*, Year 54, No. 47, p. 1. Paris, November 19, 19

This paper is not a complete study of the whole question. The writ limits himself to the demonstration of the advantages realized at the sug factory of Port-Salut-Verberie by the use of hydrosulphites at the com mencement of the work of purification.

This operation costs about 1*d* per ton of beets, and allows of a savi of 30 per cent. on the limestone and 32 per cent. on the coke; there follo a corresponding decrease in the scums, in the loss of sugar in the cake, the water required for washing it and in the expense of the filtering ma in the press filters. Calculated per ton of beets, these savings work out follows:

	d.
Stone and coke	3 ¾
Sugar in the scums	1 ¼
Water (economy of fuel)	1
Filters	½
	6 ½ *d*

Account should also be taken of the more rapid evaporation and the almost complete suppression of incrustations, which involves an econom of fuel. But it is only in a well-conducted factory that hydrosulphit can be of use.

PLANT DISEASES

GENERAL INFORMATION.

LEGISLATIVE AND ADMINISTRATIVE MEASURES.

Modification of the Laws on Phylloxera Control in Italy. — Legge del 26 giugno 1913, n. 786, che approva modificazioni al testo unico delle leggi 6 giugno 1901, n. 355, e 7 luglio 1907, n. 490, approvato con R. decreto 17 maggio 1908, n. 343, sui Consorzi di difesa della viticultura; ed al testo unico, emanato con R. decreto 1 marzo 1888, n. 2552 (Serie 3ª), delle leggi intese ad impedire la diffusione della fillossera. — *Bollettino del Ministero di Agricoltura, Industria e Commercio*, Year XII, Vol. II, Series A, Part 11-12, pp. 338-340. Rome, September 13-20, 1913.

Art. 1. — The Antiphylloxera Societies, constituted in accordance with s. 2, 3 and 4 of the laws of June 6, 1901 (No. 355), and July 7, 1907 (490), may benefit by loans repayable in 25 years for the purpose of enabling them to establish nurseries for the production of American stocks with which to reconstitute vineyards attacked and destroyed by phylloxera.

The Ministry of Agriculture, Industry and Commerce, shall fix, according to the report of the Consultative Commission on Plant Diseases (1), the amounts to be granted to each Society or Federation of Societies.

The necessary funds for the loans will be furnished by the Treasury of Deposits and Loans (" Cassa Depositi e Prestiti ") at an interest not exceeding 4 per cent., and they shall not exceed 3 million francs a year, or a sum total of 16 millions.

The budget will include a special clause dealing with the grants of the Treasury of Deposits and Loans placed at the disposal of the Ministry of Agriculture for the purpose of loans to the Societies. The budget of the Ministry of Agriculture shall also include a corresponding clause concerning the payment of the loans to Societies after due approval of their work.

Any balance remaining at the end of a year shall be carried forward to the following year's account.

Art. 2. — The interest on the loans shall be paid to the Treasury of Deposits and Loans in July of each year by the Ministry of Agriculture, who shall enter it in a special clause of the budget.

1) See No. 413, *B.* Feb. 1912 (*Ed.*)

Seventy-five per cent of the annuities is charged to the Ministry of Ag culture and the remainder to the borrowing Societies, whose contributio will be guaranteed by assignments made over to collectors. To be entit to the loan, the Society must undertake to pay according to Art. 12 of t law of May 17, 1908 (No. 343), for 25 years the contribution which shall at least equivalent to the amount of the annuity due to the Treasury.

Art. 3. — Societies of any particular province or district may combine form a Federation. These Federations may in the interests of Societ requesting it, negotiate loans according to the conditions of the preced articles. Each Society will make its own payments by means of assig ments according to Art. 3.

Art. 4. — For three years after the law has come into force, t Federations and Societies may obtain from the Ministry of Agricultu reimbursement to the extent of two-thirds of the cost of the American vi distributed to their members for the reconstitution of vineyards destro by phylloxera.

Art. 5. — The Federations of Antiphylloxera Societies of each Regi may nominate, subject to the approval of the Ministry of Agricultu a technical agent for the direction of protective measures for the vineya of the Region.

The Federation shall be directed by a Regional Committee compos of three members; one appointed by the Provincial Deputations, a second the Antiphylloxera Societies, and the third to be the technical agent. T Minister of Agiculture may, when he considers fit, appoint a special deleg to represent him on the Committee, who has the right to vote.

The Provincial Commissions shall consist of three members: one nom nated by the Ministry of Agriculture, a second by the Provincial Depu tion, and the third by the Antiphylloxera Societies. The administrati of each Society shall be in the hands of a Commission of five members.

Art. 6. — To provide for the expenses anticipated according to Art. 2, special clause will be included in the budget of the Ministry of Agricultu for 1913-14, granting the sum of 192 000 francs for each financial y until a sum total of 1 536 000 francs is reached.

To meet expenditure anticipated under Art. 4, a grant of 450 000 fra under clause 50 of the financial year 1912-1913 in the budget of the Minis of Agriculture will be made, beginning with the financial year 1913-1914.

Art. 7. — No indemnity will be paid to proprietors for vines destro in infected and protected zones; the latter may not be more than 10 met (33 ft.) in width.

At the same time the Ministry of Agriculture may grant special subsid in accordance with rules to be fixed by an enactment, for the destruct of vines in vineyards belonging to small proprietors or cultivated direc by small tenants.

Art. 8. — In the case of outbreaks over limited areas or threaten large areas of unattacked vines, the Ministry of Agriculture may on the s gestion of the Provincial Deputation appoint a Local Commission cons ing of five members representing respectively the Ministry of Agricultu

Ministry of Finance, the Provincial Deputations, the Antiphylloxera ety and the vine-growers in the infected district. This Commission esponsible for arranging and carrying out the preventive measures.

The Ministry of Agriculture may delegate to it power to destroy infected protected zones.

In the provinces possessing Antiphylloxera Societies, the Provincial mission assumes the above-mentioned powers. The President of the ety in the infected region and the Provincial Councillor will take part he proceedings of the Commission.

The expenses incurred in the destruction of vines under these circum- ces shall be provided for by the Ministry of Agriculture, to be reimbursed e proportions of 40 per cent. by the province, 10 per cent. by the Society, 50 per cent. by the State.

The repayment of the sums due to the Treasury by the province and the iety will be effected by assignments to their respective collectors.

Art. 9. — This deals with the powers of the government to regulate ious conditions concerning the laws affected.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

– **Partial Damages of Frost on Winter Cereals resembling Damage by Wild Animals.** — ZIMMERMANN in *Zeitschrift für Pflanzenkrankheiten*, Vol. XXIII, Part 6, pp. 332-334, plates IV-VI. Stuttgart, 1913.

The German Stations of Phytopathology frequently receive in winter imens of winter grain (chiefly rye) supposed to be damaged by wild nals, in particular rabbits. Such plants are generally found to be in the stage of a leaf disease induced by frost.

The action appears to be as follows: in periods of frost without much w, parts of the blade (generally the tip) become discoloured by destruc- of the chlorophyll, and eventually die. If the weather is damp, fungi h as *Septoria* and *Cladosporium* develop on these parts and may invade healthy tissue to some extent; but in dry weather the diseased parts ivel up and drop off, thus producing an effect similar to nibbling by ents.

The crops which recover best from this frost damage are those that have eloped well owing to early sowing or to the frost coming late. Crops light soil seem to be more susceptible, while rye after rye or oats seems to recover so well as after other crops.

BACTERIAL AND FUNGOID DISEASES.

73 – **The Occurrence of Rust Spores in the Interior of Wheat and B Grains.** – BEAUVERIE, J. in *Comptes Rendus hebdomadaires des séances de l'Aca des Sciences*, 1913, 2nd Half-year, Vol. 157, No. 18 (Nov. 3, 1913), pp. 787-790. Paris,

Continuing the observations made in 1912 (1) in the district of Bey (Ain), the writer found large numbers of cereal grains containing the mycel or uredo and teleuto-sori of rust. To detect their presence in wheat grai is necessary to cut sections, since the fungus is localised more or less de in the pericarp and parenchyma of the groove. The writer has been a to show that the mycelia and spores belong to *Puccinia graminis*.

All the six-rowed barleys examined showed the presence of uredosp of *P. glumarum* in rows between the veins of the pale; the sori actually de lop on the inside of the pales, but owing to the fusion of these with pericarp they come to lie within the grain and are turned towards the inter In the case of two-rowed barley *P. glumarum* was found on the stems, wi the ears remained free. The writer has observed a similar attack on *Bro mollis* and *Agropyrum*, but the sori were not as readily visible to the nak eye as in the case of barley.

In all cases where the caryopses were attacked by the mycelium was observed that this did not spread into the albumen or the embry it appears to be stopped in its progress by the tough membranes surrou ing the aleurone layer of bare caryopses and by the adjacent epider layers of the pale and pericarp in covered grains. It is only when t protective layer is broken (as in threshing) that the mycelium can penetra

The writer is thus led to infer that on all fruits of Gramineae attack by *Puccinia* the sori are turned towards the interior. The dehiscence these sori can only take place as a result of the destruction and decomp sition of the layers of cells covering them; this only takes place by bac rial or other decomposition after the seed has germinated.

Finally it appears that the occurrence of rust spores within the caryop may be of considerable practical importance from the point of view of t spread of the disease.

74 – **Contribution to the Biology of Naked Smut of Barley (*Ustilago nud*** – BROILI, J. and SCHIKORRA, W. in *Berichte der deutschen botanischen Gesellsch* Vol. XXXI, Part 7, pp. 336-339, 1 fig. Berlin, 1913.

This is a preliminary communication of the results of researches in the biology of naked smut of barley begun by Broili at Jena and continu by him at Bromberg in collaboration with Schikorra.

Sections of caryopses, when treated with chloral hydrate, immediate show the presence or otherwise of the fungus. Out of 409 caryopses fro ears artificially infected, 162 showed the presence of mycelium.

(1) See No. 879, *B.* July 1913.

Broili had already observed that on ears artificially infected the glumes often became partially separated. In 1913 this was used as a basis ecting grains suspected of infection: of 21 selected grains, 13 produced ed plants. With commercial seed it has been possible by using this cter to reduce the percentage of infected plants from 2.3 to 1.6, as 1 by field trials in 1913.

The distribution of mycelium in the seeds and seedlings was worked y staining microtome sections with gentian violet and methyl orange. researches have shown that the mycelium in resting and germina- eeds is especially abundant in the region of the scutellum, but is also it in various parts of the embryo.

To induce growth of the dormant mycelium in the grains, portions of as nearly sterile as possible were sown onto potato media and nutri- ar and gelatine. Pure cultures were obtained from all. The cultures different grains all produced the same characteristic growth of ungus. Inoculation experiments were undertaken to confirm its ty with the original smut: potato cultures were used for inoculating is parts of the growing stems, and the pistil during flowering. The ty of the fungus was also confirmed by observations on the nuclear ion of the cells, which were found to correspond with that given by tcher for *Ustilago Maydis*.

In the duration of vitality of the fungus no new information has been ed. The attack of the disease on the crop of Bethge II barley sown mberg in 1913 from the seed of the 1908 harvest appeared in the percentage (2.3) as the crop of the same seed sown in 1909.

The method of inducing growth of the quiescent mycelium in the caryop- ill be useful in testing the action of means of destroying smut; it s easy to determine if the mycelium has been damaged or killed.

MEANS OF PREVENTION AND CONTRO

Cicinnobolus sp. Parasitic on Apple Mildew (*Oidium farinosum*). — ERSTEIN, O. in *Zeitschrift für Pflanzenkrankheiten*, Vol. XXIII, Part 7, pp. 394-396. ttgart, November 18, 1913.

After enumerating the species of *Cicinnobolus* described in previous as parasitic on other injurious fungi — *Cicinnobolus* sp. on *Sphaero- nors-unae* (1), *C. Cesatii* f. *Euonymi* on oak mildew (2), *C. Kusanoi* on *n* sp., *C. Abelmoschi* on *O. Abelmoschi* (3) — the writer records as new ccurrence in Prussia of *Cicinnobolus* sp. on *O. farinosum*. This case bserved on apple twigs attacks by *Oidium* (4) in the districts of lorf and Trebnitz.

See No. 300, *B.* Jan. 1911.
See No. 998, *B.* March 1911.
See No. 240, *B.* Jan. 1912. In addition to the above species, *C. bremiphagus*, on *graminicola*: cf. No. 878, *B.* July 1913.
See No. 1356, *B.* Sept. 1912. (*Ed.*).

76 — **Diseases and Pests of Plants in Belgium in 1911 and 1912.** — Poskin (Entomological Service) and MARCHAL, E. (Phytopathological Service). — *Ministè l'Agriculture et des Travaux publics, Office rural, Rapports et Communications*, N pp. 59-85, figs. 1-2. Brussels, 1913.

The meteorological conditions during 1911 were quite different fr those of 1912, the former year being hot and dry and the latter c and wet.

Fungi. — In 1911 *Urocystis occulta* was very abundant on r *Puccinia glumarum* was more abundant on wheat than usual, w *P. graminis* was only occasional on oats. In 1912 the percentage of rowed barley attacked by *Ustilago Hordei* was high, whilst *U. Jens* on barley and *Puccinia graminis* on oats were less abundant.

Potato blight did not appear in 1911, but scab was prevalent, and same may be said of heart-rot of beets. Owing to the heavy rainfal 1912 potatoes were in some cases blighted to the extent of 40 per cen the crop; *Macrosporium Solani* was noticed in great abundance for the time, without doing serious damage. The nearness of centres of in tion of wart disease (*Synchytrium endobioticum*), which has not yet found in Belgium, induced the authorities to make known among fan the characters of this serious disease.

Endives suffered considerable loss in 1912 from *Aecidium Lact sativae*.

In 1911 *Exobasidium Azaleae* was common on azaleas, and in 19 fungus identified as *Pyrenochaeta Bergevini* on *Aspidistra*.

Sphaerotheca mors-uvae did not appear in 1911, but in the follo year it almost everywhere completely destroyed the goosebery crop. 1911 *Aecidium Grossulariae* was also common on *Ribes* and *Gymnospo gium Sabinae* on pears; *Septoria piricola* was rare. The "Rhine dise of cherries, not yet well known, also appeared in rare instances. The e sive heat produced frequent scorching of vine leaves, especially in badly-ventilated houses.

Lophodermium brachysporum was recorded on *Pinus Strobus* for the time in 1912; it does not do much damage.

Insects. — Roses were attacked by aphids, *Typhlocyba rosae* and thredinids. The attacks of *Hyalopterus pruni*, *Myzus ribis* and *M.* on fruit trees were perhaps worse than usual. *Aphis mali* was unus bad, while *Schizoneura lanigera* continues to spread.

M. Poskin had already recorded that native oaks were seriously naced by *Heterognomon viridana*, *Coccus quercicola* and mildew, espe on calcareous soils; in the neighbourhood of Valenciennes, the Bup *Agrilus biguttatus* has also been very harmful. The following insects been observed on *Quercus palustris*: *Trypodendron domesticum*, *Xyle dispar*, *Ips quadripunctatus*, *I. quadriguttatus* and *Soronia grisea*.

Mammals. — Ranysz virus has been found efficacious against ro including rats, in various places.

. **Inquiry and Observations on Straw Blight of Wheat** (1) **in the Department f Aisne, France.** — GUERRAPAIN, A. and DEMOLON, A. in *Journal d'Agriculture ratique*, 1913, Vol. II, No. 44, pp. 566-567, 1 fig.; No. 46, pp. 627-630. Paris, ctober 30 and November 3, 1913.

The writers have made a very general inquiry by means of corres- lents on the disease known as "piétin" or "pied noir" (straw lt), which has for some years been so rampant as to cause alarm ng the farmers of the Department of Aisne. In 1913 this disease ced the crop by 5 to 10 per cent., and in some cases even 60 cent.

The following questions were discussed in the inquiry: influence of tic conditions, distribution of the disease, effect of soil and cultural itions(season, density of sowing, varieties of wheat grown, manures), ts attacked, effect of the preceding crop, efficacy of copper sulphate. From a consideration of the information received from their correspon- s the writers remark that, although no remedy has yet been found, the ulturist is not quite defenceless. The following causes appear to ur the development of the disease: *a*) an abnormally mild winter; cessive growth early in the season owing to early sowing, excess of gen and the particular variety grown, etc.; *c*) infection of the soil, ly where winter grain (especially wheat) is taken frequently: the ma- and the stubble contain the source of infection.

On the other hand, the following factors tend to diminish the spread e disease, either by protecting the plant against infection or by making ore resistant: *a*) early and hard winters; *b*) not sowing the crop too : land which has been previously attacked should not be sown first; oiding excessive growth of the corn before winter: a dressing of super- phate and nitrate of soda may be given in the early spring; *d*) tho- h ploughing in of the manure and stubble in preparing for wheat; badly infested land, lengthening the rotation, taking some such crop erne.

There is little probability that any practical remedy can be found. Ac- ling to the writers it is better to adopt preventive measures, which be easier to carry out when more complete knowledge of the mode nfection has been obtained.

***Stilbum flavidum*, Parasitic on Coffee, and its Systematic Position.** — BLANC, A. and RANGEL, E. in *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, 2nd Half year, Vol. 157, No. 19 (Nov. 10, 1913) pp. 858-860. Paris, 1913.

Stilbum flavidum Cooke is well known throughout tropical and sub- ical America as the cause of roundish dry spots on the leaves of coffee. writers have recently studied this fungus in the neighbourhood of de Janeiro on coffee and other plants (*Eriobotrya japonica* and various astomaceae, Compositae and Rubiaceae). There is little doubt that *lavidum* occurs naturally in the forests on various shrubs. This origin

(1) See also No. 731, *B.* April 1912 and No. 1103 *B.* Sept. 1913. (*Ed.*).

explains the local distribution of the fungus, which in Brazil occurs chi in the coastal regions, where it finds the heat and moisture necessary its development.

All attempts at classification had been unsuccessful owing to the sta lity of the fungus. In moist chambers the writers have at last obtain fructifications of a typical Agaric, the characters of which refer it to the ge *Omphalia*; it apparently constitutes a new species (*O. flavida*). T resemblance in colour and the position of the basidiomycetes on the ed of the spots, as well as the occurrence in some of the spots of all interm diate stages between *Stilbum* and *Omphalia*, lead the writers to consi that the former is merely an abortive and sterile stage of the latter. The a sence of reproductive organs in the sterile form is compensated by the veg tative growth of the cells of the atrophied pileus, which becomes loose a may attach itself to other plants. This is their ordinary method of repr duction; the *Omphalia* forms always require very damp conditions, such must be rare even in forests during the rainy season. The persistence great humidity is not the only condition requisite for the development the *Omphalia* fruits: it seems that they only develop on the edges of the spots, that is to say in the parts in which the mycelium is young and w nourished.

79 — ***Fusarium bulbigenum*** **on Narcissus Bulbs.** — MASSEE, G. in *Royal Bota Gardens, Kew, Bulletin of Miscellaneous Information*, No. 8, pp. 307-309, 1 pl London, 1913.

This disease was first observed on Narcissus bulbs three years ag but did not cause serious damage until this year. The fungus which d stroys the interior of the bulbs was first described in 1887 as *Fusarium bulb genum* Cooke and Massee, but it was not considered a parasite.

The first symptoms of the disease are yellowish spots which grow in siz become brown and develop pale salmon-coloured specks, at first gelatino and becoming brown and dry on exposure to the air. These specks a the spore masses of *Fusarium*, which spread the disease to neighbouri plants. The mycelium of the leaves grows downwards into the bulb where it develops rapidly in the fleshy scales. The first symptoms attack in the bulbs are found round the neck, but the whole bulb soon b comes uniformly brown in colour. A delicate white mycelium is formed the scales, in which are embedded the chlamydospores. The characteris conidia of *Fusarium* also appear. The complete destruction of the bu is soon completed by saprophytic fungi (*Penicillium*) and insects (*Rhabdite*

The chlamydospores set free by the decay of the bulb germinate the soil and produce secondary spores which infect the leaves of narci in the following spring.

Young leaves inoculated with the spores showed signs of the disea in six days, and the symptoms spread with the growth of the leaves. Myc lium was found in considerable quantity in the tissues one week after infe tion. It sems very probable that infection of the young leaves takes pla by means of the secondary spores produced by the chlamydospores and th the successive infection of the lower parts of the plant and the bulb takes pla

spores washed down from the diseased patches of the leaves. Chlamydo-es are also found abundantly in the leaf tissues. The spread of the se may be effected in two different ways: either by spores of the fungus ained in bulbs only slightly diseased, or from infected soil.
The disease is well known in Holland, and it has probably been re-intro-d into England in imported Dutch bulbs slightly infected.

The Rotting of Bunches of Grapes produced by *Phoma* sp., in Algeria. – TRABUT, L. in *Bulletin agricole de l'Algérie et de la Tunisie*, Year 19, No. 17, p. 341-342. Algiers, September 10, 1913.
In 1913 a serious disease broke out in a vineyard at Ténès (Algiers), ng the entire withering of the bunches; the disease first appeared on colouring fruit and continued to develop after the fruit was ripe, ng a large portion to wither up. The petioles were also attacked in cases, showing first a whitish tinge, then darkening; the leaves then up and fell off. The shoots and fruits were sprayed with copper ate several times, but without result.
On examining the tissues at the origin of the peduncle, the writer found gus with large spores easily recognised as a species of *Phoma*, resem-*Coniothyrium Diplodiella*, which causes white rot. Thus the writer utes the damage to a specialised form of white rot. The fungus evi-y causes a withering of the bunches by checking the flow of the sap, ace of the parasite has been found on the leaves, but it is very probable it attacks the petioles. This particular form of white rot is remarkable at it does not attack the fruits, which simply wither.
More detailed study is required to determine the exact importance of disease, its causes, and suitable means of preventing it.

ARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

PARASITIC AND OTHER INJURIOUS FLOWERING PLANTS.

On the Germinating Power of Seeds of *Orobanche crenata* after pas-ng through the Digestive Tracts of Cattle and after Fermentation in the ung. — MORETTINI, A. in *Le Stazioni sperimentali agrarie italiane*, Vol. XLVI, rt 9, pp. 599-606, Modena, 1913.
The writer has conducted experiments at the Royal Institute of Experi-al Agriculture at Perugia, on the seeds of *Orobanche crenata*, which does it deal of damage to beans in the centre and south of Italy (1). The t of these researches was to determine: *a*) if the seeds can resist the ng and digestive processes when eaten by cattle; *b*) if the germinating r of the seeds is affected in the subsequent action of the dung and

From the results of experiments carried out from 1911 to 1913, the writer udes that the germinating power of the seeds is not affected in

See No. 867, *B.* May 1912 and No. 1362, *B.* Sept. 1912. (*Ed.*).

passing through the digestive tract of cattle when eaten with ordin forage, the majority of the seeds being expelled within 12 to 48 hours af ingestion. On the other hand they lose their power of germination when su jected to the fermentative changes of the dung. They are also affect similarly when immersed in the liquid manure.

The destructive action of the dung is equally efficacious if the see are mixed with it when it is already partially decomposed. In actual pra tice, therefore, decomposed dung is not an agent for dispersing the see as is the case with fresh dung. Thus there is no danger from throwing t fruit capsules of *Orobanche* into dung heaps that are well conserved, thou their destruction by more certain means is always preferable.

The writer concludes that, considering the anatomical and physi gical affinities among the better known species of *Orobanche*, similar me may be adopted for destroying the seeds of the other species parasitic crops.

82 – ***Fagopyrum tataricum* as a Weed among Buckwheat in Volhynia** (Russi — KAMENSKY, K. in *Wissenschaftliches Comité des landwirtschaftlichen Ministeri Bulletin für angewandte Botanik*, Year 6, No. 7, pp. 496-497. St. Petersburg, 1913.

In the summer of 1912 the writer observed *Fagopyrum tataricum* as a fairly abundant weed in fields of buckwheat in Volhynia, though t species had not been definitely recorded before from the district. It see very probable that it has been imported into this district, as into oth parts of Russia-in-Europe (Chernigov, Kursk, Yekaterinoslav, Kherso Don), though it is indigenous to Siberia.

INSECT PESTS.

83 – **First Annual Meeting of the "Deutsche Gesellschaft für angewa Entomologie".** (2) — *Communicated to the International Institute of Agriculture.*

The German Society of Applied Entomology ("Deutsche Gesellsch für angewandte Entomologie") held its first annual meeting from t 21st to the 25th of October, 1913, at Würzburg, Bavaria.

By invitation of the German Pomological Society, Eisenach (Sa Weimar), was chosen as the place for the next annual meeting of the Soci The presidency of Doctors Escherich, Schwangart and Heymons, hith provisional, was confirmed at the meeting, and in addition Doctor Wi of Frankfort was appointed secretary. A special commission was appo ted for studying questions relating to the organization of Applied E mology in the different branches of agriculture, colonial entomology medicine, as well as the breeding of beneficial insects.

A considerable sum was contributed towards funds for the maintena of travelling research studentships.

(1) See also No. 1401, *B.* May 1911.
(2) See No. 890, *B.* July 1913.

MEANS OF PREVENTION AND CONTROL

***Bacillus Gortynae, B. Pyramsis I* and *B. Pyrameis II*, parasitic in the larvae of *Gortyna ochracea* and *Pyrameis cardui*.** (1) — PAILLOT, A. in *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, 2nd Half-Year, Vol. 157, No. 15, pp. 608-611. Paris, October 1913.

The writer describes the morphological and cultural characteristics of two new bacilli, isolated from the tissues of the larvae of *Gortyna ochracea* and *Pyrameis cardui*. The former caused a small epidemic amongst the larvae in May 1913. There is little to distinguish the diseased larvae in the early stages, but in the later stages the movements gradually become weaker; after death the body decomposes forming a blackish mess. Inoculation of healthy larvae with serum containing the bacilli from diseased ones does not always produce infection, though it is always successful with the larvae of *Lymantria dispar*.

Acclimatization of *Novius cardinalis* in France. — MARCHAL, PAUL in *Comptes rendus hebdomadaires des séances de l'Académie des Sciences*, 1913, 2nd Half-Year, Vol. 157, No. 15 (Oct. 13, 1913), pp. 561-564. Paris, 1913.

The writer gives the results of the campaign of 1912 in the South of France (Alpes-Maritimes) under the Direction of the Scientific Service of the Ministry of Agriculture for the Control of *Icerya purchasi* (2) by means of *Novius cardinalis* (3).

A succession of supplies of this ladybird was obtained by the Paris Entomological Station from Italy, Portugal and the United States. Large numbers of these insects were bred in cages and some 1000 individuals in different stages of development were placed in boxes or metallic tubes with many large holes and hung on various plants (Aurantiaceae and ornamental shrubs) attacked by the scales towards the 15th of August.

By the end of September they had become acclimatized. At the end of 1912 they had spread over all the infected trees, and in the garden in which the first batch had been distributed the scale was entirely destroyed. The development of both insects was arrested during the winter. In the following spring the scale insect broke out again. Fresh colonies of the ladybirds were distributed and in July and August they had so reduced the scale insects as to be short of food. However, a sufficient number survived to make a fresh outbreak of the scale in the early part of October.

The writer considers that this scale is now completely under control in the South of France owing to the acclimatization of *Novius cardinalis*.

INSECTS INJURIOUS TO VARIOUS CROPS.

Injurious Insects and Other Animals observed in Ireland during the Year 1912. — CARPENTER, GEORGE H. in *Economic Proceedings of the Royal Dublin Society*, Vol. II, No. 6, pp. 79-104, figs. 1-9, plates X-XI. Dublin, 1913.

The writer gives an account of insects observed as injurious to crops and forest trees in Ireland in 1912.

(1) See No. 1308, *B. Nov.* 1913. (*Ed.*).
(2) See No. 621, *B. May* 1913; No. 891, *B. July* 1913; Nos. 1010 and 1013, *B. Aug.* 1913.
(3) See No. 891, *B. July* 1913. (*Ed.*).

87 – **The Serpentine Leaf-miner (*Agromyza pusilla*) injurious to Al and Other Crops in the United States.** – WEBSTER, F. M. and PARKS, T in *The Journal of Agricultural Research*, Vol. I, No. 1, pp. 59-88, figs. 1-17, pl Washington, October 1913.

Agromyza pusilla is a minute yellow and black fly and was descri in 1830 as occurring in Central Europe, but without definite locality or plant. The habits of the larvae of this insect, as leaf-miners of clo have long been known both in Europe and America. With the rapid crease of alfalfa culture in the United States, especially in the irrigated tions of the West, the damage of this insect amongst forage crops has more frequently brought to the attention of the Bureau of Entomology it has been the subject of investigations by several members of the tion of Cereal and Forage Crop Insect Investigations during three ye

As a result of recent research, the following species are considered nonymous with *A. pusilla*: *A. pumila* Meig., *A. strigata* Meig., *A. exilis* M *A. amoena* Meig., *A. puella* Meig., *A. pusio* Meig., *A. orbona* Meig., *A. bi* Meig., *A. diminuta* Walker (?), *Oscinis trifolii* Burg., *Oscinis brassicae* Ri

It is generally distributed throughout the United States, having a range of food-plants. It also occurs in Europe, but on fewer host-pla In the larval state it is commonly found in alfalfa fields during the sum The larvae injure the foliage of the plant by burrowing between the u branes of the leaf and devouring the parenchyma. The injury takes form of a serpentine mine which encircles the leaf, gradually widening the larva increases in size. Leaves of white clover and frequently of y alfalfa often have the entire cellular tissue devoured, leaving only the membranes. Usually only one larva is present in each leaf.

The injury from this insect is greatest in the south-west, where the coloured leaves, which in severe cases become brown, are someti present in sufficient mumbers to lower the quality and grade of the h The injured leaves can be found in the fields from May until Novem the larvae continuing to feed until killed by frost. In Florida the la continue feeding throughout the winter.

The insect hibernates in the puparia beneath the surface of the at the base of the plants. In latitude 40° there are five or six generati and the number varies with the length of the growing season. Generat overlap to such an extent that all stages can be found in the fields du most of the summer.

During the hottest part of the summer the larvae are usually found those plants protected from the direct rays of the sun, and in the arid so west the insect almost completely disappears from the fields during period, reappearing again in September.

The eggs are deposited in the leaf tissue and inserted in punctu identical with those made by the adult in feeding. The period of incu tion during June is about four days. The larval period lasts the s length of time, during which the larvae confine themselves to one leaf o and feed day and night. In the Eastern States pupation occurs entir in the soil, while in the arid Western States it usually takes place in

l chambers of the leaf, and is of ten days' duration in June. Thus the ge period of the complete life cycle is 23 days.

Besides alfalfa, the following field crops are subject to attack: clover, eas, rape and cotton.

)ther species of *Agromyza* have similar habits and are easily confused, l. *angulata* Loew, *A. coquilletti* Malloch, *A. virens* Loew and *A. melam-* var. *marginalis* Malloch, well-known parasites of timothy, wheat, oats grasses. In these attacks the mine usually extends the entire width e leaf and may kill the plant if it is very young.

The larvae and pupae are liable to the attack of numerous parasitic ts, which are highly efficient in keeping the pest under control; but parasites are less numerous on the approach of cool weather. They s follows: *Diaulinus begini* Ashm., *D. websteri* Cwfd., *Chrysocharis ains-* wfd., *C. parksi* Cwfd., *Derostenus arizonensis* Cwfd., *D. diastatae* How., *inctiventris* Cwfd., *D. pictipes* Cwfd., *D. varipes* Cwfd., *Daulinopsis cal-* *ma* Cwfd., *Daulinopsis* sp., *Cirrospilus flavoviridis* Cwfd., *Cirrospi-* p., *Zagrammosoma multiplicata* Ashm., *Closterocerus utahensis* Cwfd., *otropis rugosithorax* Cwfd., *Eucoila hunteri* Cwfd., *Sympiesis* sp. (?), *malus* sp., *Opius agromyzae* Vier., *O. aridus* Gahan, *O. brunneipes* n, *O. suturalis* Gahan, *Triphleps* sp. and *Erythraeus* sp.

Many of them are very widely distributed and attack more than one es of leaf-miner.

Frequent cutting of alfalfa kills the larvae in the leaves and does much rotect this crop. This method should be followed where the injury mes serious. Deep autumn or winter ploughing is advocated for an- forage crops and cereals, in order to bury deeply the hibernating puparia ed near the surface of the ground.

The Metallic Flea Beetle *(Haltica pagana)*, a New Pest of Strawberries n Victoria (Australia). — French C. (Jun.) in *The Journal of the Department of Agriculture of Victoria, Australia*, Vol. XI, Part 10, p. 591. Melbourne, October 1913.

Recently the strawberry crops in the districts of Wandin and Evelyn been seriously damaged by swarms of insects which made numerous l holes on the leaves and young buds, causing them to wither. This t has been identified by the writer as *Haltica pagana*, an indigenous le formerly feeding on two other Rosaceous plants, *viz. Acaena ovina* *A. Sanguisorbae* or " sheep burrs ".

This is an additional example of an indigenous insect leaving its natural and attacking an introduced plant. The writer issues a warning of langers of the insect to other rosaceous crops (apples, pears, plums, etc.). Arsenate of lead is an effective remedy, but cannot be used when the ts are bearing fruit. Kerosene oil or benzole might be used to prevent ttack and the insects may be caught in quantities by shaking the plants tarred boards.

INJURIOUS VERTEBRATES.

IOUS RATES.

89 — **The Control of Voles in the Val di Chiana, Italy.** — PASSERINI, N. MARCHI, C. in *Atti della Reale Accademia economico-agraria dei Georgofili di Fi* Series 5, Vol. X, Part 4, pp. 363-367, 1 fig. Florence, 1913.

In the autumn of 1912, after the ploughing-up of some grassland wheat, so many voles appeared as to endanger the crop. Experiments made on voles in captivity by feeding them on maize poisoned with w arsenic, sodium arsenite or zinc phosphide (1) ; the latter substance was most effective and was preferred in spite of its cost, a mixture containing cent. being sufficient to destroy the vermin within 4 or 5 hours.

To avoid poisoning fowls, the mixture was placed between two bound crosswise by pieces of wire. This method gave very good res as dead voles soon began to be found in the fields ; on digging into burrows, many more were found, as many as 20 in a single bur The treatment was extended and the voles entirely exterminated. method is very economical, since the traps are protected from rain ; in case they were left in position from November to March.

A larger number of traps was placed in the badly infested region, they were moved from place to place as the voles were destroyed. E trap may serve for about 500 square yards, and the total cost does not ceed 1*s* 6*d* per acre.

The dead voles on the surface of the fields attracted large numbe kestrels, which devoured them leaving only the head and diges apparatus.

(1) See also No. 329, *B.* March 1913.